F.T. Alexandra Mahaney, State Bar No. 125984
WILSON SONSINI GOODRICH & ROSATI
Professional Corporation
12235 El Camino Real, Suite 200
San Diego, CA 92130
Telephone: (858) 350-2300
Facsimile: (858) 350-2399
Email: amahaney@wsgr.com

Bruce R. Genderson (*admitted pro hac vice*)
Aaron P. Maurer (*admitted pro hac vice*)
Rachel Shanahan Rodman (*admitted pro hac vice*)
Adam D. Harber (*admitted pro hac vice*)
WILLIAMS & CONNOLLY LLP
725 Twelfth St. NW
Washington, DC 20005
Telephone: (202) 434-5000
Facsimile: (202) 434-5029

Attorneys for Defendant and Counterclaimant
SENORX, INC.

IN THE UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN JOSE DIVISION

HOLOGIC, INC., CYTYC CORP., and HOLOGIC L.P., Plaintiffs, v. SENORX, INC., Defendant.	CASE NO.: 08-CV-0133 RMW **DEFENDANT SENORX, INC.'S NOTICE OF MOTION AND MOTION FOR PARTIAL SUMMARY JUDGMENT OF NON-INFRINGEMENT ('813 PATENT, CLAIMS 11 & 12; '204 PATENT, CLAIMS 4 & 17; AND '142 PATENT CLAIM 6)**
SENORX, INC., Counterclaimant, v. HOLOGIC, INC., CYTYC CORP., and HOLOGIC L.P., Counterdefendants.	Date: June 25, 2008 Time: 2:00 p.m. Courtroom: 6, 4th Floor Judge: Hon. Ronald M. Whyte

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NOTICE OF MOTION AND MOTION

TO ALL PARTIES AND THEIR ATTORNEYS OF RECORD HEREIN:

PLEASE TAKE NOTICE that on June 25, 2008 at 2:00 p.m. (in connection with the claim construction hearing scheduled in this matter), or as soon thereafter as may be heard, in the courtroom of the Honorable Ronald M. Whyte, Courtroom 6, 4th Floor, 280 South 1st Street, San Jose, California, Defendant SenoRx, Inc. ("SenoRx") will and hereby does move for partial summary judgment of non-infringement of claims 11 and 12 of U.S. Patent No. 5,913,813 (the "'813 patent); claims 4 and 17 of U.S. Patent No. 6,413,204 (the "'204 patent"); and claim 6 of U.S. Patent No. 6,482,142 (the "'142 patent").

SenoRx requests the Court hold claim 12 of the '813 patent, claim 17 of the '204 patent, and claim 6 of the '142 patent not infringed because SenoRx's Contura™ Multi-Lumen Balloon ("Contura") does not contain a plurality of solid radiation sources. SenoRx further requests the Court hold claims 11 and 12 of the '813 patent and claim 4 of the '204 patent not infringed because, applying SenoRx's proposed construction of predetermined spacing, there is not a predetermined constant spacing between the alleged "inner spatial volume" (under any definition) of the Contura and the outer surface of the Contura, *i.e.*, the Contura does not contain an inner spatial volume that is concentric with and the same shape as its outer volume. Alternatively, SenoRx requests that the Court hold claims 11 and 12 of the '813 patent not infringed under Plaintiffs' proposed construction of "predetermined constant spacing" because the spacing between the alleged "inner spatial volume" (under any definition) of the Contura and the outer surface of the Contura is not constant in all directions.

This Motion, if granted, would dispose of all asserted claims of the '813 and '204 patents, as well as one of three asserted claims of the '142 patent. SenoRx brings the present Motion for Partial Summary Judgment of Non-Infringement because by resolving these issues as a matter of law, the case will be greatly simplified and appropriately streamlined for the jury.

This Motion is made pursuant to Fed. R. Civ. P. 56, Local Rule 56-1, and Judge Whyte's Standing Orders. SenoRx bases its Motion upon this Notice of Motion and Motion, the accompanying Memorandum of Points and Authorities in Support thereof, the Declaration of

Colin G. Orton, Ph.D. in Support of SenoRx's Opening Claim Construction Brief and Motion for Partial Summary Judgment of Non-Infringement, the Declaration of Williams F. Gearhart in Support of SenoRx's Motion for Partial Summary Judgment of Non-Infringement, the Declaration of Adam Harber in Support of SenoRx's Motion for Partial Summary Judgment of Non-Infringement, and exhibits thereto.

MEMORANDUM OF POINTS AND AUTHORITIES

Defendant SenoRx respectfully submits that based on the claim construction proposed by either Plaintiffs or Defendant in the *Markman* briefs filed simultaneously herewith, claim 12 of the '813 patent, claim 17 of the '204 patent, and claim 6 of the '142 patent are not infringed because there is no dispute that SenoRx's Contura does not contain a plurality of solid radiation sources.[1] In addition, claims 11 and 12 of the '813 patent and claim 4 of the '204 patent are not infringed under SenoRx's proposed construction of predetermined spacing because there is not a predetermined constant spacing between the alleged "inner spatial volume" (under any definition) of the Contura and the outer surface of the Contura, *i.e.*, the Contura does not contain an inner spatial volume that is concentric with and the same shape as its outer volume. Alternatively, even under Plaintiffs' proposed construction of predetermined spacing, claims 11 and 12 of the '813 patent are not infringed because the spacing between the alleged "inner spatial volume" (under any definition) of the Contura and the outer surface of the Contura is not constant in all directions. Therefore, this Court is respectfully requested to enter summary judgment of non-infringement of claims 11 and 12 of the '813 patent, claims 4 and 17 of the '204 patent, and claim 6 of the '142 patent.

[1] All exhibits ("Ex.") referenced herein are exhibits to the Declaration of Adam D. Harber in Support of SenoRx's Motion for Partial Summary Judgment of Non-Infringement, unless otherwise specified. The '813 patent is Ex. 1, the '204 patent is Ex. 2, and the '142 patent is Ex. 3.

ISSUES TO BE DECIDED

Whether claim 12 of the '813 patent, claim 17 of the '204 patent, and claim 6 of the '142 patent are not infringed because the Contura does not meet the claim limitations requiring a "plurality" of solid radiation sources.

Whether claims 11 and 12 of the '813 patent and claim 4 of the '204 patent are not infringed because the Contura does not meet the claim limitations requiring "a predetermined constant spacing" ('813 patent) and "a predetermined spacing" ('204 patent) between the inner and outer spatial volumes.

LEGAL STANDARD

A. Summary Judgment.

Summary judgment is appropriate "if the pleadings, the discovery and disclosure materials on file, and any affidavits show that there is no genuine issue as to any material fact and that the movant is entitled to judgment as a matter of law." Fed. R. Civ. P. 56(c); *Celotex Corp. v. Catrett*, 477 U.S. 317, 322 (1986); *Ethicon Endo-Surgery, Inc. v. U.S. Surgical Corp.*, 149 F.3d 1309, 1315 (Fed. Cir. 1998). Summary judgment is a useful tool to promote judicial economy and avoid unnecessary trials. *Scripps Clinic & Res. Found. v. Genentech, Inc.*, 927 F.2d 1565, 1570 (Fed. Cir. 1991).

B. Non-Infringement.

Determining whether a claim has been infringed requires a two-step analysis. *PC Connector Solutions LLC v. SmartDisk Corp.*, 406 F.3d 1359, 1362 (Fed. Cir. 2005). First, the court must construe the claim to determine its scope and meaning. *Id.* Second, the construed claim must be compared to the accused device. *Id.* "To prove infringement, the patentee must show that the accused device meets each claim limitation, either literally or under the doctrine of equivalents." *Playtex Prods., Inc. v. Procter & Gamble Co.*, 400 F.3d 901, 906 (Fed. Cir. 2005).

An "accused infringer seeking summary judgment of noninfringement may meet its initial responsibility either by providing evidence that would preclude a finding of infringement, or by showing that the evidence on file fails to establish a material issue of fact essential to the

patentee's case." *Novartis Corp. v. Ben Venue Labs., Inc.*, 271 F.3d 1043, 1046 (Fed. Cir. 2001). Summary judgment of non-infringement is proper when no reasonable jury could find that the accused device contains every limitation recited in the properly construed claim. *PC Connector*, 406 F.3d at 1364.

STATEMENT OF RELEVANT FACTS REGARDING THE CONTURA DEVICE

The accused device, the Contura, is pictured below:

The Contura is a balloon catheter device for delivering therapeutic radiation to target tissue. The balloon is labeled "A" in the depiction above and is spherical. The balloon is attached to the end of a catheter body, labeled "B." There are a number of lumens that run through the catheter body from one end of the Contura (the proximal end, "C") through to the other end (the distal end, "D"). Five of these lumens (the "treatment lumens") are designed to have a radiation source inserted into them; one is positioned in the center of the catheter body, and the other four are offset from the center lumen and spaced at 90 degree increments (so that one is located above, one below, and one to either side of the central lumen). *See* Declaration of William F. Gearhart ("Gearhart Decl.") ¶ 6.

In use, the device is inserted into a lumpectomy cavity of a woman, where the balloon portion is inflated with a contrast fluid. Declaration of Colin G. Orton ("Orton Decl.") ¶ 18. A CT scan of the device *in situ* is then made, and a radiation oncologist and radiation physicist determine how to best deliver radiation to the patient. *Id.* After a dose plan is optimized and approved, an afterloader is connected to the catheter by the lumen(s) at the proximal end of the device. *Id.* ¶ 19. Afterloaders used with the Contura are machines that are shielded and contain a single radiation source, generally Iridium 192 ("Ir-192"). *Id.* The radiation source used with

the Contura is cylindrically shaped. *Id.* During treatment, the radiation source generally is inserted sequentially by the afterloader into multiple lumens of the Contura, although a single lumen has been used on rare occasions. *Id.*; Gearhart Decl. ¶ 8. Radiation is delivered at precise locations along the distal end of each lumen by pausing and moving the radiation source according to the dose plan. *Id.* The radiation source is withdrawn back into the afterloader after treatment is delivered. *Id.* Treatment with the Contura typically takes approximately five days, after which the device is surgically removed from the patient. *Id.*

As used by physicians, the Contura device utilizes only one radioactive solid source. Orton Decl. ¶ 47. This is because the afterloaders compatible with the Contura hold only one radioactive source at a time, and thus can place only one radiation source at a time into the Contura device. *Id.* ¶¶ 46-47. Indeed, none of the commercially available afterloaders in the United States today are capable of placing more than one radiation source at a time. *Id.* ¶ 46. Each radiation source remains in the afterloader for approximately 90 days before it is replaced, which is far longer than the approximately five-day duration of Contura therapy. *Id.* ¶¶ 19, 47.

ARGUMENT

A. The Contura Does Not Meet the "Plurality" Claim Limitations.

Plaintiffs assert that SenoRx's Contura literally infringes claim 12 of the '813 patent, claim 17 of the '204 patent, and claim 6 of the '142 patent. This assertion fails as a matter of undisputed fact. The Contura does not contain a plurality of solid radiation sources, a required element for each of these claims. Summary judgment of non-infringement therefore should be entered.

1. Plaintiffs' Infringement Contentions.

Plaintiffs offer two theories of infringement, both asserted to be based on literal infringement.[2] First, Plaintiffs contend that multiple treatment lumens of the Contura "allow

[2] Although Plaintiffs in their Infringement Contentions assert infringement based on the doctrine of equivalents for many of the claim elements, they do not assert infringement under the doctrine of equivalents for any of the "plurality" claim limitations, and for good reason. Any (continued...)

multiple solid radiation sources . . . to be arrayed simultaneously within" separate lumens. *See* Ex. 4 (Plaintiffs' Preliminary Infringement Contentions ("Pls' Infr. Cont.")) Appendix A at 15; *id.* Appendix B at 16; *id.* Appendix C at 13 (emphasis added). Second, in the alternative, Plaintiffs argue that the Contura literally infringes because "a single solid radionuclide on a source wire can be inserted sequentially into one or more predetermined locations within multiple treatment lumens." *See id.* Appendix A at 15; *id.* Appendix B at 16-17; *id.* Appendix C at 13. These contentions fail as a matter of law based on the undisputed facts. Because the Contura does not satisfy the "plurality" claim limitations of the three patents-in-suit, summary judgment of non-infringement should be granted.

2. The Contura Does Not Meet the "Plurality" Limitations.

Dependent claim 12 of the '813 patent requires that the claimed apparatus contain a "plurality of radioactive solid particles." Ex. 1 ('813 patent), claim 12. Similarly, dependent claim 17 of the '204 patent and independent claim 6 of the '142 patent require a "plurality of solid radiation sources."[3] Ex. 2 ('204 patent), claim 17; Ex. 3 ('142 patent), claim 6.

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argument that the Contura's single solid radiation source is equivalent to two or more solid radiation sources would impermissibly vitiate the "plurality" claim limitation, in direct contravention of the well-established "all limitations" ("all elements") rule. Under that rule, "an element of an accused product or process is not, as a matter of law, equivalent to a limitation of the claimed invention if such a finding would entirely vitiate the limitation." *Freedman Seating Co. v. American Seating Co.*, 420 F.3d 1350, 1358 (Fed. Cir. 2005); *see also Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 520 U.S. 17, 29 (1997) ("Each element contained in a patent claim is deemed material to defining the scope of the patented invention . . . . It is important to ensure that the application of the doctrine [of equivalents], even as to an individual element, is not allowed such broad play as to effectively eliminate that element in its entirety."). Moreover, under the principle of specific exclusion, a corollary to the all elements rule, use of the term "plurality of solid radiation sources" specifically excludes devices containing only "single solid radiation sources." *See Asyst Techs., Inc. v. Emtrak, Inc.*, 402 F.3d 1188, 1195 (Fed. Cir. 2005) (under the specific exclusion principle, "the term 'mounted' can fairly be said to specifically exclude objects that are 'unmounted'").

[3] The phrases "radioactive solid particles" and "solid radiation sources" are synonymous. The terms "particles" and "sources" are used interchangeably in all three patents, *Compare* Ex. 3 ('142 patent), col. 3:7-8 ("radiation source comprises a plurality of spaced apart solid radioactive particles") *with id.*, col. 9:50–10:1 ("radiation source comprising a plurality of solid radiation sources"), and all three patents state that "radioactive micro spheres of the type available from 3M Company of St. Paul, Minn., may be used" as the "solid radioactive particles" or the (continued...)

As explained in SenoRx's *Markman* Brief, filed simultaneously herewith, the claim limitation "plurality of solid radiation sources" means "two or more separate radioactive solid sources placed in the inner spatial volume at the same time." *See* Def. *Markman* Br. at 26. SenoRx's Contura, however, does not use two or more radioactive solid particles or sources. Orton Decl. ¶¶ 46-47. In all configurations of the Contura, only a single solid radiation source is inserted into the device. *Id.* In fact, the afterloader devices used to load the radiation source into the Contura are only capable of placing one radiation source into the Contura at any one time. *Id.* Additionally, the claim limitations require that the "plurality of solid radiation sources" be present at the same time. It is undisputed that this does not occur in the use of the Contura, and Plaintiffs do not and cannot demonstrate otherwise. Thus, under SenoRx's proposed claim construction, the claims containing the "plurality" limitation are not infringed as a matter of law because the Contura only uses a single source, not two or more sources, and because more than one source is not placed into the device at the same time. *See Wolverine World Wide Inc. v. Nike Inc.*, 38 F.3d 1192, 1199 (Fed. Cir. 1994) (When an "express claim limitation is absent from the accused product, there can be no literal infringement as a matter of law.").

Plaintiffs have not offered any construction of the "plurality" limitations. In their Preliminary Claim Construction, Plaintiffs simply state "No construction necessary" for the limitations "plurality of radioactive solid particles" and "plurality of solid radiation sources." Ex. 5 (Pls' Cl. Constr.) Appendix A at 3; *id.* Appendix B at 4; *id.* Appendix C at 4. Presumably, therefore, Plaintiffs agree that the ordinary and customary meaning of "plurality" should be applied. That ordinary meaning is "two or more." *See Dayco Prods., Inc. v. Total Containment, Inc.*, 258 F.3d 1317, 1327-28 (Fed. Cir. 2001) ("'plurality,' when used in a claim, refers to two or more items, absent some indication to the contrary"). Accordingly, even if the Court agrees that no construction is necessary, the plurality limitation would still be missing and the claims

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"radioactive source." *See* Ex. 3 ('142 patent), col. 4:60-62, Ex. 1 ('813 patent), col. 4:1-3; Ex. 2 ('204 patent), col. 4:49-51.

are not infringed as a matter of law – the Contura device utilizes only a single radioactive solid source.

To get around their "plurality" problem, Plaintiffs make two arguments, both of which fail as a matter of law. First, Plaintiffs contend that multiple treatment lumens of the Contura "allow multiple solid radiation sources . . . to be arrayed simultaneously within" the lumens. *See* Ex. 4 (Pls' Infr. Cont.) Appendix A at 15; *id.* Appendix B at 16; *id.* Appendix C at 13 (emphasis added). This argument misses the point. It is legally irrelevant whether the Contura is capable of being used with multiple radiation sources (even assuming, contrary to the undisputed evidence, that there were compatible afterloaders available in the United States that could load multiple radiation sources), when, as discussed above, the undisputed evidence is that SenoRx's Contura is not used with two or more radioactive solid particles or sources. *See* Orton Decl. ¶¶ 46-47. An apparatus claim is not infringed simply because the accused device is "capable" of being made into an infringing device. *Cross Medical Prods., Inc. v. Medtronic Sofamor Danek, Inc.*, 424 F.3d 1293, 1311-12 (Fed. Cir. 2005). Rather, "to infringe an apparatus claim, the device must meet all of the [claim's] structural limitations." *Id.* (emphasis added). That is, the device must actually be made and used in such a manner as to satisfy all the claim elements.

In *Cross Medical*, the Federal Circuit expressly rejected the argument that an accused device need only be capable of infringing. The issue in that case was whether the claim limitation "operatively joined" was met by the accused orthopedic surgical implant. Despite the court's construction that "operatively joined" meant "the interface and the bone segment are connected and in contact," 424 F.3d at 1306, the patentee, like Plaintiffs here, argued that there was infringement so long as the accused device was "capable" of being configured to meet all of the structural limitations of the apparatus claim. *Id.* at 1310. The court rejected this argument, finding that "the claim does not require that the interface be merely 'capable' of contacting bone; the claim has a structural limitation that the anchor seat be in contact with bone." *Id.* at 1311. Accordingly, the court found no direct infringement by the accused infringer because there was

no evidence that the manufacturer itself made "an apparatus with the 'interface' portion in contact with bone." *Id.*

The same is true here. The claims at issue do not require the apparatus to be "capable" of containing a plurality of solid radiation sources. Rather, the claims include a structural limitation requiring that the claimed apparatus contain a plurality of solid radiation sources. SenoRx does not directly infringe because it manufactures the device without any radiation source. Because physicians using the Contura do not use it with two or more solid radiation sources, *see* Orton Decl. ¶¶ 46-47, the "plurality" claim limitation is never met, and there is no direct infringement by anyone. And because there is no direct infringement, there can be no inducement of infringement or contributory infringement. *See Dynacore Holdings Corp. v. U.S. Philips Corp.*, 363 F.3d 1263, 1277 (Fed. Cir. 2004) ("absent direct infringement of the claims of a patent, there can be neither contributory infringement nor inducement of infringement") (quoting *Met-Coil Sys. Corp. v. Korners Unlimited, Inc.*, 803 F.2d 684, 687 (Fed. Cir. 1986)).

Second, Plaintiffs contend that the Contura literally infringes because "a single solid radionuclide . . . can be inserted sequentially into . . . multiple treatment lumens." *See* Ex. 4 (Pls' Infr. Cont.) Appendix A at 15. Under SenoRx's proposed construction, this contention fails as a matter of undisputed fact, because two or more radionuclides must be present at the same time, and it cannot be disputed that this does not occur with the use of a single radionuclide.

But even if SenoRx's construction is not adopted, Plaintiffs' argument still fails as a matter of law. The act of moving a single radionuclide to multiple locations does not transform the single object into two or more objects; the claim is to plural radiation sources. The lynchpin of Plaintiffs' argument in this respect is that "two or more" includes "single" or "one." Merely to state the argument is to refute it. Indeed, inserting a single radionuclide sequentially necessarily means that only the one radionuclide ever is present. These are apparatus claims, and if all of the elements do not exist together, the claimed apparatus does not exist. *See Cross Medical*, 424 F.3d at 1311-12. Because there never are two or more radionuclides, the claimed apparatus never exists, and there is no infringement.

To be sure, if the inventors had wanted their patents to encompass sequential insertion of a radionuclide, they easily could have included such language within their claims. At the time of filing, the inventors certainly were well aware that afterloaders were available that had the ability to insert solid radiation particles into a brachytherapy apparatus. *See* Ex. 3 ('142 patent), col. 5:8-10 ("solid radiation emitting material 36 can be inserted through lumen 14 on a wire 34, for example using an afterloader"); Ex. 2 ('204 patent), col. 4:54-56 (same). At least since the early 1990s, it was well known that afterloaders had the ability to move radionuclides from one dwell position to another within a radiation therapy apparatus. Orton Decl. ¶ 45. The inventors, however, did not claim such a device. Rather, the claims as written require that two or more radioactive sources be present at the same time. Because this limitation is not met by the Contura device, the claims are not literally infringed.

For all of these reasons, this Court should enter summary judgment of non-infringement of claim 12 of the '813 patent, claim 17 of the '204 patent, and claim 6 of the '142 patent. *See Wolverine World Wide*, 38 F.3d at 1199 ("If an express claim limitation is absent from the accused product, there can be no literal infringement as a matter of law.").

B. The Contura Does Not Meet the Predetermined Spacing Limitations of the '813 and '204 Patents.

Plaintiffs assert that SenoRx's Contura literally infringes the "predetermined constant spacing" limitation of asserted claims 11 and 12 of the '813 patent, and the "predetermined spacing" limitation of asserted claim 4 of the '204 patent.[4] Because the claims as properly construed require constant spacing between the surfaces of the inner and outer volumes, and the Contura device fails to satisfy such a limitation, summary judgment of non-infringement should

[4] Claims 11 and 12 of the '813 patent depend from claim 1, which requires "a predetermined constant spacing between said inner spatial volume and the radiation transparent wall." Ex. 1 ('813 patent), claims 1, 11, 12. Claim 4 of the '204 patent depends from claim 3, which requires "a predetermined spacing . . . between said inner spatial volume and the expandable surface element." Ex. 2 ('204 patent), claims 3-4.

be entered on claims 11 and 12 of the '813 patent and claim 4 of the '204 patent.[5] Additionally, even under Plaintiffs' construction, there is no infringement of the claims of the '813 patent because the spacing between the inner spatial volume and outer spherical balloon of the Contura is not "constant in all directions." *See* Def. *Markman* Br. at 4.

1. Plaintiffs' Infringement Contentions.

For the '813 patent, Plaintiffs state that the "predetermined constant spacing" element of claim 1(c) (incorporated into claims 11 and 12) is met because "the central treatment lumen is located within the balloon . . . along the longitudinal axis of the applicator. . . . The Contura™ balloon surrounds and contains the inner spatial volume(s) discussed above. The spacing (predetermined by one of skill in the art) between the inner spatial volume and the wall of the Contura™ balloon is constant. This claim element is thus literally infringed." Ex. 4 (Pls' Infr. Cont.) Appendix A at 5 (emphasis in original).

For the '204 patent, Plaintiffs similarly state that "The Contura™ balloon surrounds and contains the inner spatial volume(s) (discussed above). The spacing between the inner spatial volume and the wall of the Contura™ balloon is constant. This claim element is thus literally infringed." Ex. 4 (Pls' Infr. Cont.) Appendix B at 12-13 (emphasis in original).

2. There Is No Infringement of the Predetermined Spacing Limitations Under SenoRx's Proposed Construction.

The goal of the '813 and '204 patents is to provide a uniform, symmetric radiation dose profile that has the same shape as the outer balloon. As discussed in SenoRx's *Markman* brief at 4-8, the asserted claims achieve this goal and avoid hot spots in the tissue by separating the surface of the inner volume (in which radioactive material is placed) from the surface of the outer balloon by a predetermined fixed distance. As demonstrated in the declaration of Dr.

[5] Plaintiffs have not asserted equivalency of these limitations under the doctrine of equivalents, and again there is good reason: prosecution history estoppel based on amendment and argument over the prior art precludes Plaintiffs' reliance on the doctrine of equivalents to reach a device in which there is not constant spacing between surfaces of the inner and outer volumes.

Orton, as a matter of geometry, this means that the inner spatial volume must have the same shape and be concentric with the outer balloon (*i.e.*, the two structures must share the same center and orientation). *See* Orton Decl. ¶ 27. Accordingly, SenoRx's proposed construction of the predetermined spacing limitations in the '813 and '204 patents[6] is:

> Fixed spacing, predetermined by one skilled in the art before administering radiation, between the wall or edge of the inner spatial volume and the radiation transparent wall of the outer, closed inflatable chamber, when inflated, which for each point on the wall or edge of the inner spatial volume, the distance to the closest point on the outer chamber is the same (*i.e.*, the inner spatial volume and outer chamber are concentric and the same shape).

To determine if the predetermined spacing limitations of the '813 and '204 patents are infringed, the Court must examine the relationship between the inner and outer volumes of the Contura. There is no dispute as to the shape and location of the surface of the outer volume once the spherical outer balloon of the Contura is expanded. The issue therefore turns on what is the "inner spatial volume" of the Contura, and how that inner volume relates to the outer balloon. Plaintiffs have identified three mutually contradictory theories regarding the identity of the inner spatial volume in the Contura. They claim the inner spatial volume is (1) each treatment lumen taken individually, (2) under the doctrine of equivalents, the treatment lumens taken collectively and the space surrounding them, and (3) the solid radionuclide source. Regardless what Plaintiffs call the inner spatial volume,[7] the Contura does not meet the requirements of the predetermined spacing limitation.

a. The Contura's Lumens, Taken Individually, Do Not Meet the Predetermined Spacing Limitations.

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[6] The '204 patent – and SenoRx's proposed construction thereof – uses the term "expandable surface element" in place of "radiation transparent wall of the outer, closed inflatable chamber." There is no dispute, however, that the two phrases reference the same structure in the claimed devices as relates to this claim element.

[7] SenoRx disagrees that any of the structures relied on by Plaintiffs constitute "inner spatial volumes" but will accept Plaintiffs definitions for purposes of this motion.

Plaintiffs contend that each of the five treatment lumens comprise an inner spatial volume (*i.e.*, they argue that the Contura has five separate inner spatial volumes). *See* Ex. 4 (Pls' Infr. Cont.) Appendix A at 4, 9; *id.* Appendix B at 4. First, there is not a predetermined constant spacing between any of these lumens and the outer surface. The four outer lumens in the balloon are arc-shaped, and arranged so as to be 5 mm offset from the central axis of the catheter at their central point. This clearly means that they are located so that the closest distance to the outer balloon is not the same for each point on any lumen, as depicted below in Figure 1. *See* Orton Decl. ¶ 34.

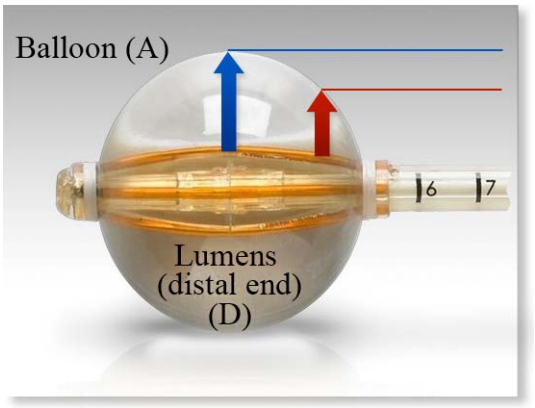

Figure 1 (Individual Offset Lumens)

Nor is the central lumen a fixed distance from the surface of the balloon. As seen in Figure 2, below, the central lumen is much closer to the balloon at its ends than at its central portion, and thus, the distance from each point in the edge of the central lumen to the closest point on the outer balloon is not the same. *See id.*

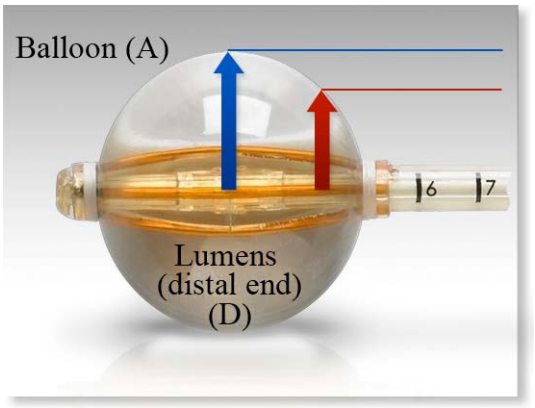

Figure 2 (Individual Central Lumen)

Accordingly, the Contura's individual lumens are not separated from the balloon by a predetermined spacing, and do not meet the predetermined spacing claim elements.

Second, the predetermined spacing elements also are not met because none of the individual lumens have the same shape as the outer balloon. Orton Decl. ¶ 34. Finally, the four offset lumens do not share a common center with the outer balloon. *Id.* Accordingly, there is no "predetermined constant spacing" or "predetermined spacing" between any of the four offset lumens and the outer balloon.

b. The Contura's Lumens, Taken Together, Do Not Meet the Predetermined Spacing Limitations.

Invoking the doctrine of equivalents, Plaintiffs argue the "five treatment lumens and the area within the balloon between and surrounding those lumens" comprise the inner spatial volume. *See* Ex. 4 (Pls' Infr. Cont.) Appendix A at 4, 9; *id.* Appendix B at 4. This irregularly shaped area – allegedly consisting of the "five treatment lumens and the area within the balloon between and surrounding those lumens," *id.* – likewise is not spaced a constant distance from the Contura's balloon, as shown in Figure 3. Therefore, this proposed configuration does not infringe the predetermined spacing claim elements for the same reasons discussed above. Orton Decl. ¶ 35.

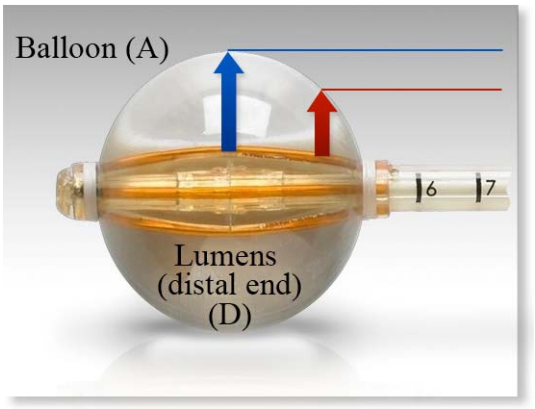

Figure 3 (Lumens (collectively))

In addition, as clearly evidenced in Figure 3, the irregular, unbounded region within the balloon between and surrounding the five "treatment" lumens has a different shape from the outer balloon. *Id.* Accordingly, the predetermined spacing claim limitation is not satisfied under Plaintiffs' second proposed interpretation of the inner spatial volume.

c. The Radionuclide Used With the Contura Does Not Meet the Predetermined Spacing Limitations.

Plaintiffs' final theory is that the solid cylindrical radionuclide source used with the Contura is itself the inner spatial volume. *See* Ex. 4 (Pls' Infr. Cont.) Appendix A at 4; *id.* Appendix B at 4. But as explained below, the radionuclide does not satisfy this claim element because (1) there is no fixed spacing between the radionuclide and the balloon, and (2) the radionuclide has a different shape from the outer balloon and therefore there is no constant spacing over its entire surface. Thus, the Contura does not satisfy this limitation.

The radionuclide is not part of the Contura device. It is instead part of the afterloader. During treatment of a patient, the radiation source is inserted into the Contura's lumens by the afterloader, and radiation is delivered at precise locations along the distal end of the lumens (called "dwell positions") by pausing and moving the radiation source through the lumens. Orton Decl. ¶ 19. An exemplary treatment plan using an afterloader in the Contura device is shown in Figure 4 below. Gearhart Decl. ¶ 10. Each rectangular box represents a possible dwell position; the green boxes depict the positions where the radionuclide would dwell during this exemplary treatment plan, and the gray boxes are positions that are not used. *Id.*

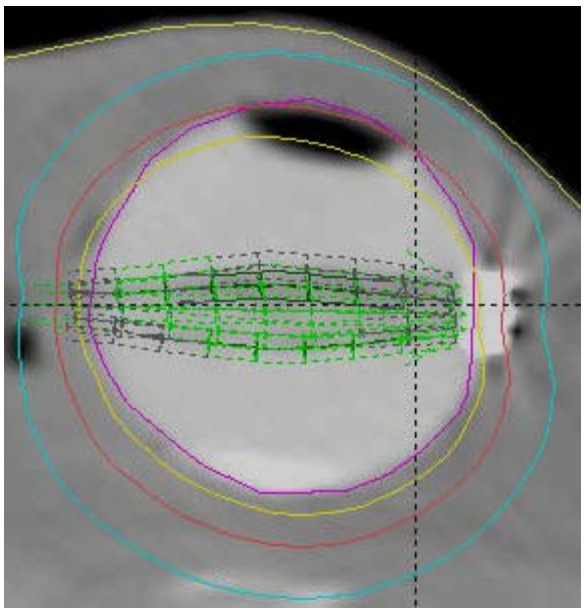

Figure 4
(Exemplary Contura Treatment Plan - Multiple Dwell, Multiple Lumen)

The undisputed evidence is that in every case of patient treatment since the commercial launch of the Contura in January 2008, the dose was delivered with multiple dwell positions. Gearhart Decl. ¶ 8. And, in the vast majority of those cases, the dose also was delivered with multiple lumens. *Id.* This means the radionuclide is moved around during treatment. Accordingly, post-launch use of the Contura does not infringe the asserted claims discussed here because the spacing is not fixed. Orton Decl. ¶ 36. Put another way, there is no constant spacing for a moving radionuclide source (*i.e.*, an inner spatial volume that moves relative to the outer expandable surface cannot have constant spacing).

Furthermore, the Contura does not satisfy this claim limitation (based on SenoRx's proposed construction) for the independent reason that the radionuclide used with the Contura is not the same shape as the outer balloon. The radionuclide is cylindrical, not spherical. Orton Decl. ¶ 36. As a result, regardless of where the radionuclide is located, the spacing between the ends of the radionuclide and the balloon is less than the spacing between the cylindrical surface of the radionuclide and the balloon. *Id.*

* * *

In sum, the accused device does not read on the predetermined spacing limitation of claim 1 of the '813 and claim 3 of the '204 patents under any of Plaintiffs' three theories of inner spatial volume. Accordingly, there is no infringement of asserted claims 11 and 12 of the '813 patent, both of which depend from claim 1, and asserted claim 4 of the '204 patent, which depends from claim 3. *See Wolverine World Wide*, 38 F.3d at 1199 (When an "express claim limitation is absent from the accused product, there can be no literal infringement as a matter of law.").

3. There Is No Infringement of the '813 Patent Under Plaintiffs' Proposed Construction.

Plaintiffs propose that the "predetermined constant spacing" element of claim 1[c] of the '813 patent should be understood as follows:

> spacing predetermined by one skilled in the art between the wall or edge of the inner spatial volume and the radiation transparent wall of the outer, closed, inflatable chamber, when inflated, which is constant in all directions if the outer chamber is spherical, or constant along a radial plane if the outer chamber is not spherical.

Def. *Markman* Br. at 4. There is no factual dispute that the Contura has a spherical outer balloon. Gearhart Decl. ¶ 6; Ex. 4 (Pls' Infr. Cont.) Appendix B at 5 ("[t]he inflatable spherical balloon is an 'expandable surface element'"); *id.* at 7 ("the wall of the spherical Contura™ balloon"); *id.* Appendix C at 3 ("[t]he outer surface of the inflatable spherical Contura™ multi-lumen balloon"); *id.* at 12 ("[t]he outer surface of the inflatable spherical Contura™ multi-lumen balloon"); *see also id.* Appendix B at 3, 6, 8, 15; *id.* Appendix C at 5, 8. Thus, even under Plaintiffs' construction, the spacing between the surface of the inner spatial volume and the wall of the Contura balloon must be "constant in all directions." For the same reasons discussed above, and as depicted in Figures 1-4, the spacing between the "inner spatial volume" of the Contura and the balloon is not "constant in all directions," regardless of the definition of inner spatial volume. Accordingly, even if Plaintiffs' construction is adopted, summary judgment of no infringement is appropriate for claims 11 and 12 of the '813 patent.

CONCLUSION

For the foregoing reasons, the Court should grant SenoRx's Motion for Partial Summary Judgment of Non-Infringement.

Dated: May 21, 2008

Respectfully submitted,

By: __/s/ F.T.Alexandra Mahaney_____

F.T. Alexandra Mahaney, State Bar No. 125984
WILSON SONSINI GOODRICH & ROSATI
Professional Corporation
12235 El Camino Real, Suite 200
San Diego, CA 92130
Telephone: (858) 350-2300
Facsimile: (858) 350-2399
Email: amahaney@wsgr.com

Bruce R. Genderson (admitted *pro hac vice*)
Aaron P. Maurer (admitted *pro hac vice*)
Rachel Shanahan Rodman (admitted *pro hac vice*)
Adam D. Harber (admitted *pro hac vice*)
WILLIAMS & CONNOLLY LLP
725 Twelfth St. NW
Washington, DC 20005
Telephone: (202) 434-5000
Facsimile: (202) 434-5029

Attorneys for Defendant and Counterclaimant
SENORX, INC.

CERTIFICATE OF SERVICE
U.S. District Court, Northern District of California,
Hologic, Inc. et al. v. SenoRx, Inc.
Case No. C-08-0133 RMW (RS)

I, Kirsten Blue, declare:

I am and was at the time of the service mentioned in this declaration, employed in the County of San Diego, California. I am over the age of 18 years and not a party to the within action. My business address is 12235 El Camino Real, Ste. 200, San Diego, CA, 92130.

On May 21, 2008, I served a copy(ies) of the following document(s):

DEFENDANT SENORX, INC.'S NOTICE OF MOTION AND MOTION FOR PARTIAL SUMMARY JUDGMENT OF NON-INFRINGEMENT ('813 PATENT, CLAIMS 11 & 12; '204 PATENT, CLAIMS 4 & 17; AND '142 PATENT CLAIM 6)

on the parties to this action by the following means:

Henry C. Su (suh@howrey.com) Katharine L. Altemus (altemusk@howrey.com) HOWREY LLP 1950 University Avenue, 4th Floor East Palo Alto, CA 94303 Telephone: (650) 798-3500 Facsimile: (650) 798-3600	Attorneys for Plaintiffs HOLOGIC, INC. CYTYC CORPORATION and HOLOGIC LP
Matthew Wolf (wolfm@howrey.com) Marc Cohn (cohnm@howrey.com) HOWREY LLP 1229 Pennsylvania Avenue, NW Washington, DC 20004 Telephone: (202) 783-0800 Facsimile: (202) 383-6610	Attorneys for Plaintiffs HOLOGIC, INC. CYTYC CORPORATION and HOLOGIC LP

☒ (BY MAIL) I placed the sealed envelope(s) for collection and mailing by following the ordinary business practices of Wilson Sonsini Goodrich & Rosati, 12235 El Camino Real, Ste. 200, San Diego, CA. I am readily familiar with WSGR's practice for collecting and processing of correspondence for mailing with the United States Postal Service, said practice being that, in the ordinary course of business, correspondence with postage fully prepaid is deposited with the United States Postal Service the same day as it is placed for collection.

☒ (BY ELECTRONIC MAIL) I caused such document(s) to be sent via electronic mail (email) to the above listed names and email addresses.

☒ (BY CM/ECF) I caused such document(s) to be sent via electronic mail through the Case Management/Electronic Case File system with the U.S. District Court for the Northern District of California.

I declare under penalty of perjury under the laws of the United States that the above is true and correct, and that this declaration was executed on May 21, 2008.

Kirsten Blue

F.T. Alexandra Mahaney, State Bar No. 125984
WILSON SONSINI GOODRICH & ROSATI
Professional Corporation
12235 El Camino Real, Suite 200
San Diego, CA 92130
Telephone: (858) 350-2300
Facsimile: (858) 350-2399
Email: amahaney@wsgr.com

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WILLIAMS & CONNOLLY LLP
725 Twelfth St. NW
Washington, DC 20005
Telephone: (202) 434-5000
Facsimile: (202) 434-5029

Attorneys for Defendant and Counterclaimant
SENORX, INC.

IN THE UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN JOSE DIVISION

HOLOGIC, INC., CYTYC CORP., and HOLOGIC L.P., Plaintiffs, v. SENORX, INC., Defendant.	CASE NO.: 08-CV-0133 RMW **DECLARATION OF ADAM D. HARBER IN SUPPORT OF DEFENDANT SENORX, INC.'S MOTION FOR PARTIAL SUMMARY JUDGMENT OF NON-INFRINGEMENT ('813 PATENT, CLAIMS 11 & 12; '204 PATENT, CLAIMS 4 & 17; AND '142 PATENT CLAIM 6)**
SENORX, INC., Counterclaimant, v. HOLOGIC, INC., CYTYC CORP., and HOLOGIC L.P., Counterdefendants.	Date: June 25, 2008 Time: 2:00 p.m. Courtroom: 6, 4th Floor Judge: Hon. Ronald M. Whyte

I, Adam D. Harber, declare that I am an associate at the law firm of Williams & Connolly LLP, admitted pro hac vice to practice before this Court in the above-captioned matter. I serve as outside counsel for Defendant SenoRx, Inc. ("SenoRx"). The following declaration is based on my personal knowledge, and if called upon to testify, I could and would competently testify as to the matters set forth herein.

1. Attached hereto as Exhibit 1 is a true and correct copy of U.S. Patent No. 5,913,813.

2. Attached hereto as Exhibit 2 is a true and correct copy of U.S. Patent No. 6,413,204.

3. Attached hereto as Exhibit 3 is a true and correct copy of U.S. Patent No. 6,482,142.

4. Attached hereto as Exhibit 4 is a true and correct copy of Plaintiffs' Disclosure of Asserted Claims and Preliminary Infringement Contentions Under Patent Local Rule 3-1.

5. Attached hereto as Exhibit 5 is a true and correct copy of Plaintiffs' Preliminary Claim Construction, and Identification of Structure Corresponding to § 112(6) Elements for U.S. Patent Nos. 5,913,813, 6,413,204, and 6,482,142, and Preliminary Identification of Evidence Pursuant to Patent Local Rule 4-2.

I declare under penalty of perjury that the foregoing is true and correct.

Dated: May 21, 2008

By: _____
Adam D. Harber

CERTIFICATE OF SERVICE
U.S. District Court, Northern District of California,
Hologic, Inc. et al. v. SenoRx, Inc.
Case No. C-08-0133 RMW (RS)

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on the parties to this action by the following means:

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I declare under penalty of perjury under the laws of the United States that the above is true and correct, and that this declaration was executed on May 21, 2008.

Kirsten Blue

Exhibit 1

US005913813A

United States Patent [19]

Williams et al.

[11] **Patent Number: 5,913,813**

[45] **Date of Patent: Jun. 22, 1999**

[54] **DOUBLE-WALL BALLOON CATHETER FOR TREATMENT OF PROLIFERATIVE TISSUE**

[75] Inventors: **Jeffery A. Williams**, Baltimore, Md.; **Christopher H. Porter**, Woodinville, Wash.; **Jeffrey F. Williamson**; **James F. Dempsey**, both of St. Louis, Mo.; **Timothy J. Patrick**; **James B. Stubbs**, both of Alpharetta, Ga.

[73] Assignee: **Proxima Therapeutics, Inc.**, Alpharetta, Ga.

[21] Appl. No.: **08/900,021**

[22] Filed: **Jul. 24, 1997**

[51] **Int. Cl.**[6] **A61N 5/00**

[52] **U.S. Cl.** **600/3**

[58] **Field of Search** 600/1–8

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,324,847 6/1967 Zoumboulis .
5,106,360 4/1992 Ishiwara et al. .
5,429,582 7/1995 Williams .
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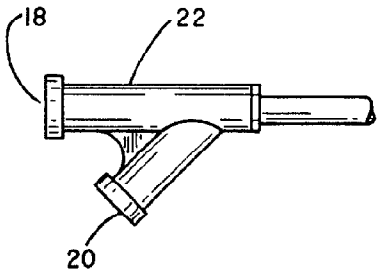
5,662,580 9/1997 Bradshaw et al. 600/3
5,782,742 7/1998 Crocker et al. .
5,785,688 7/1998 Joshi et al. .

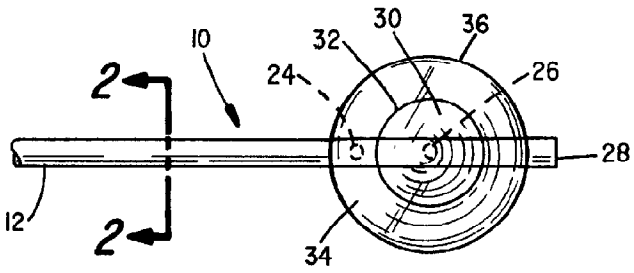
Primary Examiner—John P. Lacyk
Attorney, Agent, or Firm—Nikolai, Mersereau & Dietz, P.A.

[57] **ABSTRACT**

An instrument for use in brachytherapy comprises a concentric arrangement of inner and outer distensible, spherical chambers disposed near the proximal end of a catheter body where one of the chambers is made to contain a radioactive material with the other chamber containing a radiation absorptive material, the apparatus functioning to provide a more uniform absorbed dose profile in tissue surrounding a cavity created by the removal of a tumor. An alternative embodiment includes non-spherical inner and outer chambers whose respective walls are spaced equidistant over the entire surfaces thereof.

13 Claims, 2 Drawing Sheets





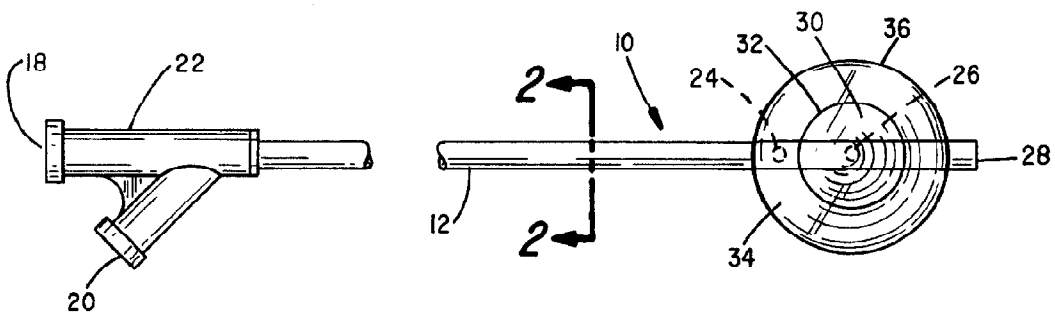


FIG. 1

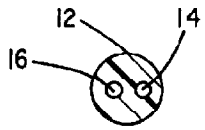


FIG. 2

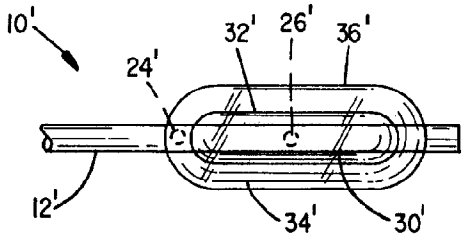


FIG. 3

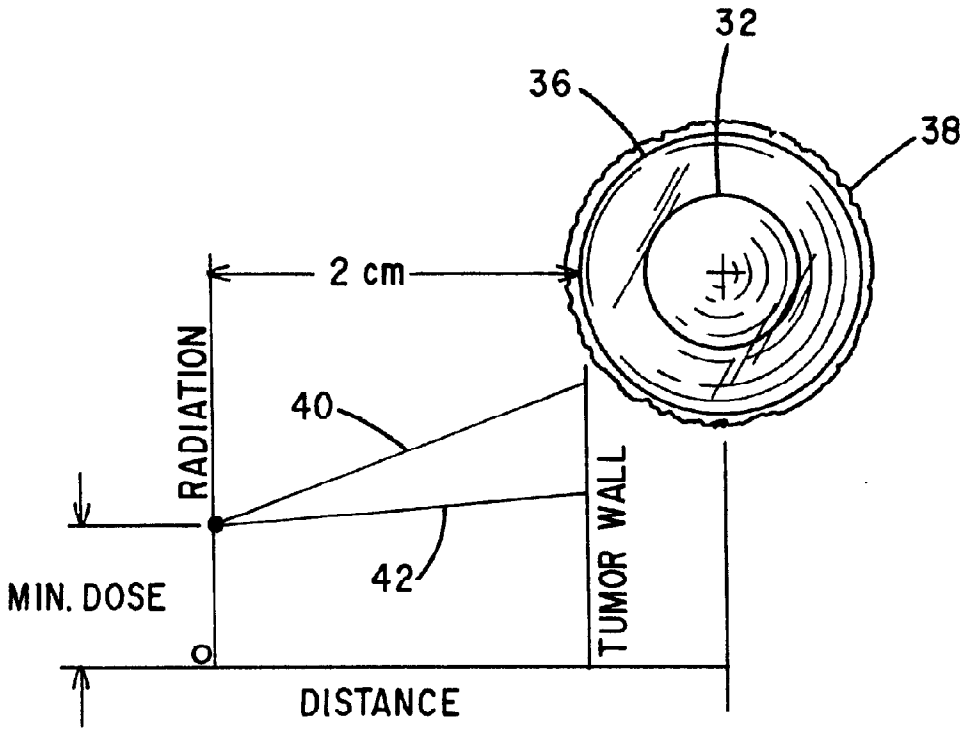


FIG. 4

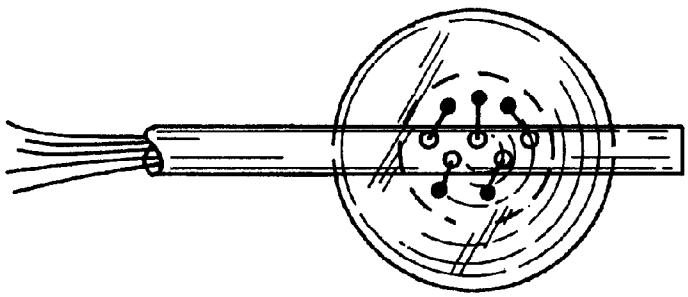


FIG. 5

DOUBLE-WALL BALLOON CATHETER FOR TREATMENT OF PROLIFERATIVE TISSUE

BACKGROUND OF THE INVENTION

I. Field of the Invention

This invention relates generally to apparatus for use in treating proliferative tissue disorders, and more particularly to an apparatus for the treatment of such disorders in the body by the application of radioactive material and/or radiation emissions.

II. Discussion of the Prior Art

In the Williams U.S. Pat. No. 5,429,582 entitled "Tumor Treatment", there is described a method and apparatus for treating tissue surrounding a surgically excised tumor with radioactive emissions to kill any cancer cells that may be present in the margins surrounding the excised tumor. In accordance with that patent, there is provided a catheter having an inflatable balloon at a distal end thereof to define a distensible reservoir. Following surgical removal of a tumor, say in the brain or breast, the deflated balloon may be introduced into the surgically-created pocket left following removal of a tumor and then the balloon is inflated by injecting a fluid having radionuclide(s) therein into the distensible reservoir, via a lumen in the catheter.

When it is considered that the absorbed dose rate at a point exterior to the radioactive source is inversely proportional to the square of the distance between the radiation source and the target point, tissue directly adjacent the wall of the distensible reservoir may be overly "hot" to the point where healthy tissue necrosis may result. In general, the amount of radiation desired by the physician is a certain minimum amount that is delivered to a site 0–3 cms away from the wall of the excised tumor. It is desirable to keep the radiation in the space between that site and the wall of the distensible reservoir as uniform as possible to prevent over-exposure to tissue at or near the reservoir wall. In treating other cancers, such as bladder cancer, where the neoplastic tissue is generally located on the bladder surface, deep penetration is unnecessary and to be avoided.

A need exists for an instrument which may be used to deliver radiation from a radioactive source to target tissue within the human body of a desired intensity and at a predetermined distance from the radiation source without over-exposure of body tissues disposed between the radiation source and the target.

SUMMARY OF THE INVENTION

We have found that it is possible to deliver a desired radiation dose at a predetermined radial distance from a source of radioactivity by providing a first spacial volume at the distal end of a catheter and a second spacial volume defined by a surrounding of the first spatial volume by a polymeric film wall where the distance from the spatial volume and the wall is maintained substantially constant over their entire surfaces. One of the inner and outer volumes is filled with either a fluid or a solid containing a radionuclide(s) while the other of the two volumes is made to contain either a low radiation absorbing material, e.g., air or even a more absorptive material, such as an x-ray contrast fluid. Where the radioactive material comprises the core, the surrounding radiation absorbing material serves to control the radial profile of the radioactive emissions from the particular one of the inner and outer volumes containing the radionuclide(s) so as to provide a more radially uniform radiation dosage in a predetermined volume surrounding the outer chamber. Where the core contains the absorbent material, the radial depth of penetration of the radiation can be tailored by controlling the core size.

DESCRIPTION OF THE DRAWINGS

The foregoing features, objects and advantages of the invention will become apparent to those skilled in the art from the following detailed description of a preferred embodiment, especially when considered in conjunction with the accompanying drawings in which:

FIG. **1** is a side view of an apparatus for delivering radioactive emissions to body tissue;

FIG. **2** is a cross-sectional view taken along the line 2—2 in FIG. **1**;

FIG. **3** is a fragmentary side view of an apparatus for administering radiation therapy in accordance with a second embodiment;

FIG. **4** is a graph helpful in understanding the operation of the apparatus of the present invention; and

FIG. **5** depicts a further embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring first to FIG. **1**, there is indicated generally by numeral **10** a surgical instrument for providing radiation treatment to proliferative tissue in a living patient. It is seen to comprise a tubular body member **12** having first and second lumens **14** and **16** (FIG. **2**) extending from proximal ports **18** and **20** in a molded plastic hub **22** to inflation ports **24** and **26** formed through the side wall of the tube **12** and intersecting with the lumens **14** and **16**, respectively.

Affixed to the tubular body 12 proximate the distal end **28** thereof is an inner spatial volume **30** which may be defined by a generally spherical polymeric film wall **32**. The interior of the chamber **30** is in fluid communication with the inflation port **26**. Surrounding the spatial volume **30** is an outer chamber **34** defined by an outer polymeric film wall **36** that is appropriately spaced from the wall **32** of the inner chamber **30** when the two chambers are inflated or otherwise filled and supported. Chamber **34** encompasses the inflation port **24**.

The embodiment of FIG. **1** can be particularly described as comprising two spherical chambers **30** and **34**, one inside the other. In accordance with a first embodiment of the invention, the outer chamber **34**, being the volume defined by the space between the inner spherical wall **32** and the outer spherical wall **36**, may be filled with air or, alternatively, a radiation absorbing fluid, such as a contrast media used in angiography. The inner chamber **30** is then filled with a material containing a predetermined radionuclide, for example, I-125, I-131, Yb-169 or other source of radiation, such as radionuclides that emit photons, beta particles or other therapeutic rays.

Those skilled in the art will appreciate that instead of having the inner spatial volume **30** defined by a generally spherical polymeric film wall as at **32**, the catheter body member **12** may have a solid spherical radiation emitting material in which event that solid sphere would be surrounded with the outer spherical wall **36** with the spatial volume therebetween occupied by a radioactive ray absorbent material, such as air, water or a contrast material.

It is further contemplated that instead of having the inner spatial volume comprising a single solid sphere, it may instead comprise a plurality of radioactive particles strategically placed within the inner spatial volume so as to radiate

in all directions with a substantially equal intensity. FIG. **5** illustrates a catheter having the inner spatial volume occupied by a plurality of radioactive beads that are mounted on the distal ends of a plurality of wires that are routed through the catheter body and exit a plurality of ports formed through the wall of the catheter body and reaching the lumen. This arrangement allows the exact positioning of the individual radiation sources to be positioned so as to generate a desired resultant profile.

It is not essential to the invention that the chambers **30** and **34** have spherical walls, so long as the spacing between the wall of the inner chamber and the wall of the outer chamber remain generally constant, such as is illustrated in FIG. **3**.

Referring to FIG. **4**, there is shown the two concentric spherical chambers of FIG. **1** defined by inner spherical wall **32** and outer spherical wall **36** disposed within the margin **38** of a surgically excised tumor. It is desired that the radiation emitted from the core **32** be capable of delivering a certain minimum dose absorbed at a location approximately 0–3 cms from the margin **38**. Curve **40** is a plot of absorbed dose vs. radial distance that would be obtained if the inner chamber defined by spherical wall **32** was not present and the entire volume of the spherical chamber defined by wall **36** were filled with the radioactive fluid. Plot **42** reflects the absorbed dose distribution as a function of radial distance when the radioactive fluid is contained within the inner chamber and is surrounded by either a gas or a more radiation absorbing material. Comparing the plots **40** and **42**, by providing the concentric arrangement depicted, the absorbed dose profile in the space between the 2 cm site and the wall of the outer balloon is maintained much more uniform, thus preventing over-treatment of body tissue at or close to the outer wall **36** of the instrument. That is to say, to obtain the same end point absorbed dose at 2 cm, it would be necessary to increase the source activity relative to that used for a completely filled (to surface **36**) configuration, assuming the same radionuclide is used in both configurations.

With no limitation intended, the distensible polymeric chambers may comprise a biocompatible, radiation resistant polymer, such as Silastic rubbers, polyurethanes, polyethylene, polypropylene, polyester, PVC, C-Flex. The radioactive fluid contained within the inner chamber **32** can be made from any solution of radionuclide(s), e.g., a solution of I-125 or I-131. A radioactive fluid can also be produced using a slurry of a suitable fluid containing small particles of solid radionuclides, such as Au-198, Y-90. Moreover, the radionuclide(s) can be embodied in a gel.

In the embodiments heretofore described, the material containing the radionuclide(s) is located in the inner chamber. The invention also contemplates that the outer chamber **34** may contain the material having the radionuclide therein while the inner chamber **30** contains the radiation absorptive material. This configuration is advantageous where a profile exhibiting higher intensity at a tissue surface with lesser penetration is desired. By using this approach, less volume of radioactive material is required than if the entire volume of the device were filled with radioactive material. Moreover, the outer chamber wall need not be spherical, yet a uniform profile is obtainable. Experiments have shown that a steeper radial absorbed source gradient can be obtained using a radiation attenuation fluid in the inner chamber **30** than otherwise obtains when only a single distensible chamber is used, as in the aforereferenced Williams U.S. Pat. No. 5,429,582. The invention also contemplates that the radioactive material in the inner core can be replaced by a core containing solid radionuclide-containing particles. For example, radioactive micro spheres of the type available from the 3M Company of St. Paul, Minn., may be used in place of the fluid. This radioactive source can either be preloaded into the catheter at the time of manufacture or loaded into the device after it has been implanted into the space formerly occupied by the excised tumor. Such a solid radioactive core configuration offers the advantage in that it allows a wider range of radionuclides than if one is limited to liquids. Solid radionuclides that could be used with the delivery device of the present invention are currently generally available as brachytherapy radiation sources.

In either the concentric spherical embodiment of FIG. 1 or the non-spherical configuration of FIG. **3**, the spacing between the inner and outer chambers needs to be held somewhat constant to avoid "hot spots". This result can be achieved by careful placement of precision blown polymer parisons or by using compressible foams or mechanical spacers in the form of webs joining the inner wall **32** to the outer wall **36**.

This invention has been described herein in considerable detail in order to comply with the patent statutes and to provide those skilled in the art with the information needed to apply the novel principles and to construct and use such specialized components as are required. However, it is to be understood that the invention can be carried out by specifically different equipment and devices, and that various modifications, both as to the equipment and operating procedures, can be accomplished without departing from the scope of the invention itself.

What is claimed is:

1. Apparatus for delivering radioactive emissions to a body location with a uniform radiation profile, comprising:

(a) a catheter body member having a proximal end and distal end;

(b) an inner spatial volume disposed proximate the distal end of the catheter body member;

(c) an outer, closed, inflatable, chamber defined by a radiation transparent wall affixed to the body member proximate the distal end thereof in surrounding relation to the inner spatial volume with a predetermined constant spacing between said inner spatial volume and the radiation transparent wall;

(d) a material containing a radionuclide(s) disposed in one of the inner spatial volume and outer chamber; and

(e) means disposed in the other of the inner spatial volume and outer chamber for rendering uniform the radial absorbed dose profile of the emissions from the one of the inner spatial volume and outer chamber containing the radionuclides.

2. The apparatus as in claim **1** wherein said inner spatial volume is an inner closed, chamber defined by a further radiation transparent wall.

3. The apparatus of claim **1** wherein the means for rendering uniform the absorbed dose profile is a radiation attenuating material.

4. The apparatus of claim **3** wherein the radiation attenuating material is selected from a group consisting of barium sulphate, water, and X-ray contrast media.

5. The apparatus as in claim **2** wherein the radionuclide is in a fluid form.

6. The apparatus as in claim **5** wherein the fluid comprises an isotope of iodine.

7. The apparatus as in claim **1** wherein the radionuclide is a slurry of a fluid containing particles of a solid isotope.

8. The apparatus as in claim 2 wherein the inner chamber contains the radioactive material.

9. The apparatus as in claim 1 wherein the outer chamber contains the radioactive material.

10. The apparatus as in claim 8 wherein the radioactive material is a fluid.

11. The apparatus as in claim 8 wherein the radioactive material is a solid.

12. The apparatus as in claim 1 wherein the material containing a radionuclide comprises a plurality of radioactive solid particles placed at predetermined locations within the inner spatial volume to provide a desired composite radiation profile.

13. The apparatus as in claim 2 wherein the inner and outer chambers are spherical in shape and are concentric.

* * * * *

Exhibit 2

US006413204B1

(12) **United States Patent**
Winkler et al.

(10) **Patent No.: US 6,413,204 B1**
(45) **Date of Patent: *Jul. 2, 2002**

(54) **INTERSTITIAL BRACHYTHERAPY APPARATUS AND METHOD FOR TREATMENT OF PROLIFERATIVE TISSUE DISEASES**

(75) Inventors: **Rance A. Winkler**, Atlanta; **Timothy J. Patrick**; **James Stubbs**, both of Alpharetta, all of GA (US)

(73) Assignee: **Proxima Therapeutics, Inc.**, Alpharetta, GA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **09/293,524**

(22) Filed: **Apr. 15, 1999**

Related U.S. Application Data

(63) Continuation-in-part of application No. 08/900,021, filed on Jul. 4, 1997, now Pat. No. 5,913,813.

(51) **Int. Cl.**[7] **A61N 5/00**
(52) **U.S. Cl.** **600/3**
(58) **Field of Search** 600/1–8

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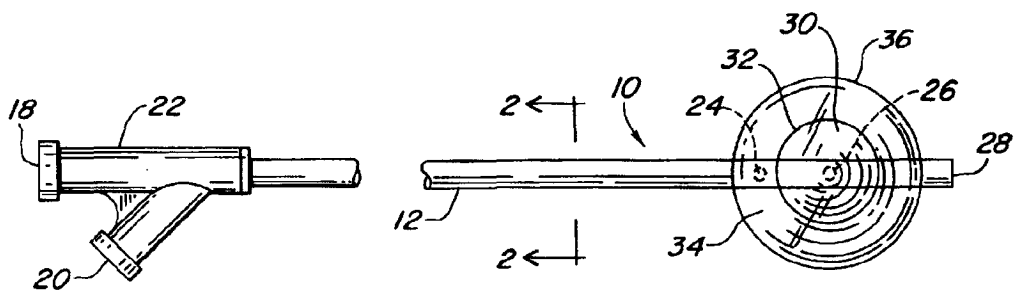
Primary Examiner—John P. Lacyk
(74) *Attorney, Agent, or Firm*—Thomas J. Engellenner; Ronald E. Cahill; Nutter, McClennen & Fish, LLP

(57) **ABSTRACT**

An interstitial brachytherapy apparatus for delivering radioactive emissions to an internal body location includes a catheter body member having a proximal end and distal end, an inner spatial volume disposed proximate to the distal end of the catheter body member, an outer spatial volume defined by an expandable surface element disposed proximate to the distal end of the body member in a surrounding relation to the inner spatial volume, and a radiation source disposed in the inner spatial volume.

36 Claims, 3 Drawing Sheets



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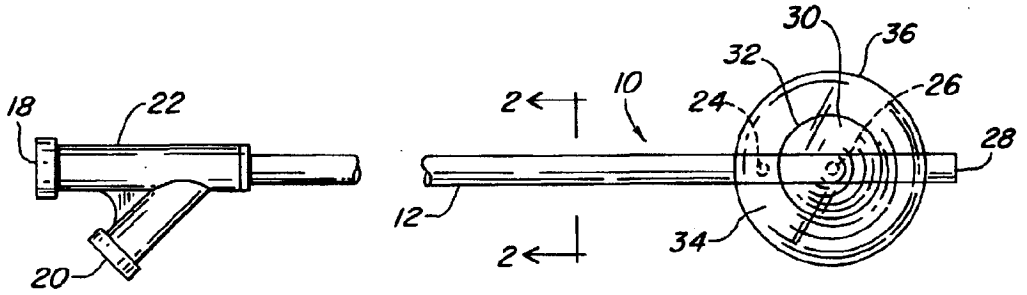

FIG. 1

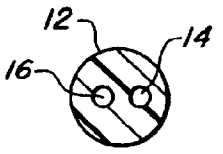

FIG. 2

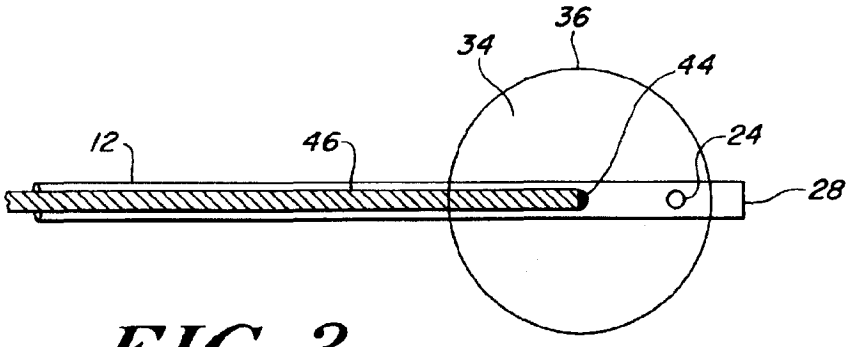

FIG. 3

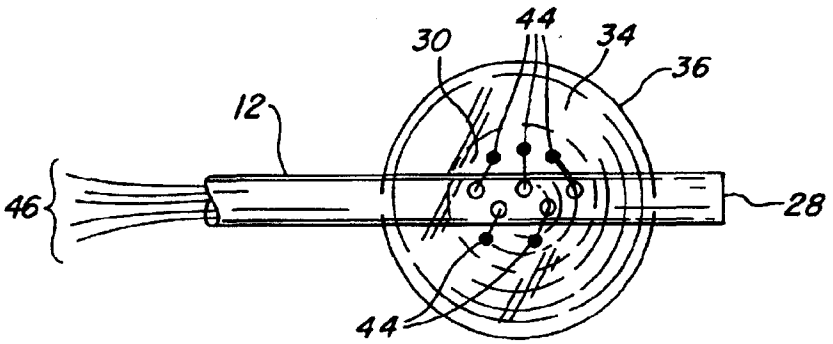

FIG. 4

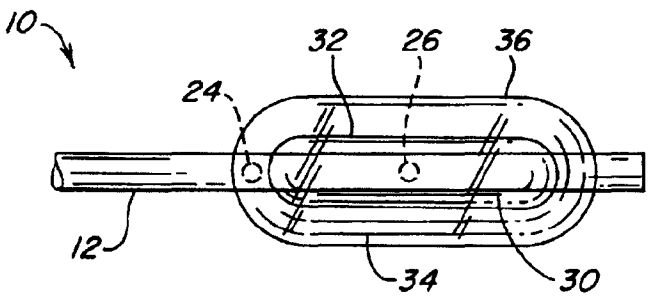

FIG. 5

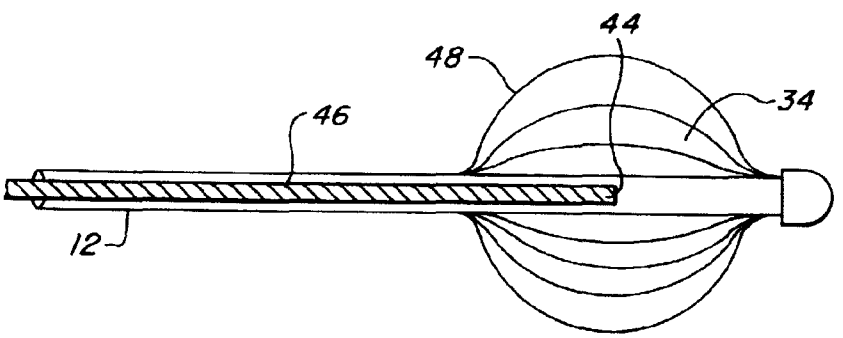

FIG. 6

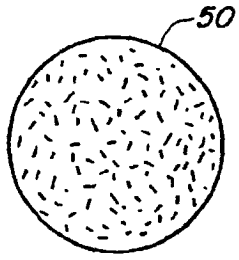

FIG. 7A

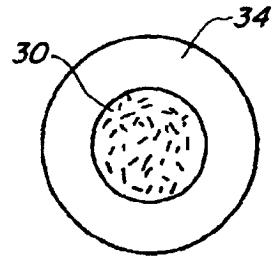

FIG. 7B

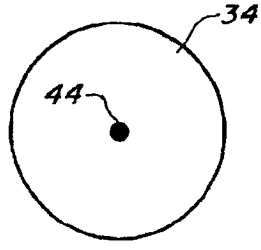

FIG. 7C

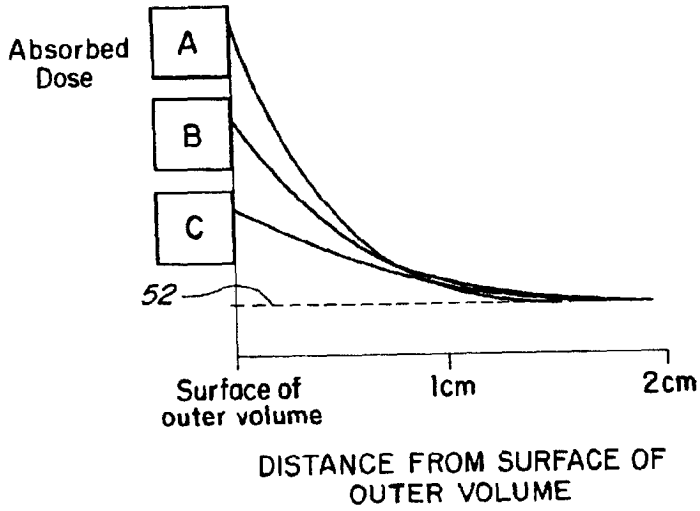

FIG. 7D

INTERSTITIAL BRACHYTHERAPY APPARATUS AND METHOD FOR TREATMENT OF PROLIFERATIVE TISSUE DISEASES

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation-in-part of U.S. patent application Ser. No. 08/900,021, filed Jul. 24, 1997, now U.S. Pat. No. 5,913,813 the contents of which are specifically incorporated herein by reference.

BACKGROUND OF THE INVENTION

The invention relates generally to apparatus for use in treating proliferative tissue disorders, and more particularly to an apparatus for the treatment of such disorders in the body by the application of radiation.

Malignant tumors are often treated by surgical resection of the tumor to remove as much of the tumor as possible. Infiltration of the tumor cells into normal tissue surrounding the tumor, however, can limit the therapeutic value of surgical resection because the infiltration can be difficult or impossible to treat surgically. Radiation therapy can be used to supplement surgical resection by targeting the residual tumor margin after resection, with the goal of reducing its size or stabilizing it. Radiation therapy can be administered through one of several methods, or a combination of methods, including external-beam radiation, stereotactic radiosurgery, and permanent or temporary interstitial brachytherapy. The term "brachytherapy," as used herein, refers to radiation therapy delivered by a spatially confined radioactive material inserted into the body at or near a tumor or other proliferative tissue disease site. Owing to the proximity of the radiation source, brachytherapy offers the advantage of delivering a more localized dose to the target tissue region.

For example, brachytherapy is performed by implanting radiation sources directly into the tissue to be treated. Brachytherapy is most appropriate where 1) malignant tumor regrowth occurs locally, within 2 or 3 cm of the original boundary of the primary tumor site; 2) radiation therapy is a proven treatment for controlling the growth of the malignant tumor; and 3) there is a radiation dose-response relationship for the malignant tumor, but the dose that can be given safely with conventional external beam radiotherapy is limited by the tolerance or normal tissue. In brachytherapy, radiation doses are highest in close proximity to the radiotherapeutic source, providing a high tumor dose while sparing surrounding normal tissue. Interstitial brachytherapy is useful for treating malignant brain and breast tumors, among others.

Interstitial brachytherapy is traditionally carried out using radioactive seeds such as ^{125}I seeds. These seeds, however, produce inhomogeneous dose distributions. In order to achieve a minimum prescribed dosage throughout a target region of tissue, high activity seeds must be used, resulting in very high doses being delivered in some regions in proximity to the seed or seeds which can cause radionecrosis in healthy tissue.

Williams U.S. Pat. No. 5,429,582, entitled "Tumor Treatment," describes a method and apparatus for treating tissue surrounding a surgically excised tumor with radioactive emissions to kill any cancer cells that may be present in the tissue surrounding the excised tumor. In order to implement the radioactive emissions, Williams provides a catheter having an inflatable balloon at its distal end that defines a distensible reservoir. Following surgical removal of a tumor, the surgeon introduces the balloon catheter into the surgically created pocket left following removal of the tumor. The balloon is then inflated by injecting a fluid having one or more radionuclides into the distensible reservoir via a lumen in the catheter.

The apparatus described in Williams solves some of the problems found when using radioactive seeds for interstitial brachytherapy, but leaves some problems unresolved. The absorbed dose rate at a target point exterior to a radioactive source is inversely proportional to the square of the distance between the radiation source and the target point. As a result, where the radioactive source has sufficient activity to deliver a prescribed dose, say 2 centimeters into the target tissue, the tissue directly adjacent the wall of the distensible reservoir, where the distance to the radioactive source is very small, may still be overly "hot" to the point where healthy tissue necrosis may result. In general, the amount of radiation desired by the physician is a certain minimum amount that is delivered to a region up to about two centimeters away from the wall of the excised tumor. It is desirable to keep the radiation that is delivered to the tissue in the target treatment region within a narrow absorbed dose range to prevent over-exposure to tissue at or near the reservoir wall, while still delivering the minimum prescribed dose at the maximum prescribed distance from the reservoir wall.

There is still a need for an instrument which can be used to deliver radiation from a radioactive source to target tissue within the human body with a desired intensity and at a predetermined distance from the radiation source without over-exposure of body tissues disposed between the radiation source and the target.

SUMMARY OF THE INVENTION

The present invention solves the problems described above by providing an interstitial brachytherapy apparatus for delivering radioactive emissions to an internal body location. The apparatus includes a catheter body member having a proximal end and distal end, an inner spatial volume disposed proximate to the distal end of the catheter body member, an outer spatial volume defined by an expandable surface element disposed proximate to the distal end of the body member in a surrounding relation to the inner spatial volume, and a radiation source disposed in the inner spatial volume. The inner and outer spatial volumes are configured to provide an absorbed dose within a predetermined range throughout a target tissue. The target tissue is located between the outer spatial volume expandable surface and a minimum distance outward from the outer spatial volume expandable surface. The predetermined dose range is defined as being between a minimum prescribed absorbed dose for delivering therapeutic effects to tissue that may include cancer cells, and a maximum prescribed absorbed dose above which healthy tissue necrosis may result.

In different embodiments, the inner spatial volume can be defined by a distensible polymeric wall containing radioactive source material which can be a fluid material, by a solid radioactive source, or by a region containing a plurality of solid radioactive sources. The outer spatial volume is defined by an expandable surface element that may be, for example, an inflatable polymeric wall or an expandable cage. The expandable surface element can cause tissue to conform to its intended shape, and preferably, the apparatus creates absorbed isodose profiles in the target tissue that are substantially similar in shape to the expandable surface element in substantially three dimensions.

The invention also provides a method for treating a proliferating tissue disease using interstitial brachytherapy at an internal body location. The method includes surgically creating access to the proliferating tissue within a patient and surgically resecting at least a portion of the proliferating tissue to create a resection cavity within body tissue. An interstitial brachytherapy apparatus for delivering radioactive emissions as described above is then provided and intra-operatively placed into the resection cavity. After a prescribed absorbed dose has been delivered to tissue surrounding the apparatus, the apparatus is removed. The radioactive source material may be placed into the interstitial brachytherapy apparatus after the apparatus is placed in the resection cavity, and may be removed before the apparatus is removed. The method has particular applications to brain and breast cancers.

DESCRIPTION OF THE DRAWINGS

The foregoing features, objects and advantages of the invention will become apparent to those skilled in the art from the following detailed description of a preferred embodiment, especially when considered in conjunction with the accompanying drawings in which:

FIG. **1** is a side view of an interstitial brachytherapy apparatus of the invention for delivering radioactive emissions to body tissue;

FIG. **2** is a cross-sectional view taken along the line **2**—**2** in FIG. **1**;

FIG. **3** is an additional embodiment of an interstitial brachytherapy apparatus of the invention having a solid radiation source;

FIG. **4** is an additional embodiment of an interstitial brachytherapy apparatus of the invention having a radiation source comprising a plurality of solid radiation particles;

FIG. **5** depicts a further embodiment of the invention wherein the inner and outer spatial volumes of the interstitial brachytherapy apparatus are non-spherical;

FIG. **6** illustrates an interstitial brachytherapy apparatus of the invention having an expandable outer spatial volume surface; and

FIGS. 7A–D illustrate the absorbed dose versus distance into target tissue for several interstitial brachytherapy apparatus configurations.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A surgical instrument **10** for providing radiation treatment to proliferative tissue in a living patient is illustrated in FIG. **1**. Surgical instrument **10** includes a tubular body member **12** having first and second lumens **14** and **16** (FIG. **2**) extending from proximal ports **18** and **20** in a molded plastic hub **22** to inflation ports **24** and **26** formed through the side wall of the tube **12** and intersecting with the lumens **14** and **16**, respectively.

Affixed to the tubular body **12** proximate the distal end **28** thereof is an inner spatial volume **30** which may be defined by a generally spherical polymeric film wall **32**. The interior of the inner volume **30** is in fluid communication with the inflation port **26**. Surrounding inner spatial volume **30** is an outer spatial volume **34** defined by an outer polymeric film wall **36** that is appropriately spaced from the wall **32** of the inner spatial volume **30** when the two volumes are inflated or otherwise supported. Outer volume **34** encompasses inflation port **24**. With no limitation intended, the distensible polymeric film walls may comprise a biocompatible, radiation resistant polymer, such as silastic rubbers, polyurethanes, polyethylene, polypropylene, polyester, or PVC.

The embodiment of FIG. **1** includes inner and outer spatial volumes **30** and **34**, one inside the other. The outer spatial volume **34**, being the volume defined by the space between the inner spherical wall **32** and the outer spherical wall **36**, may be filled with air or, alternatively, a radiation absorbing fluid, such as a contrast media used in angiography. The inner volume **30** is then filled with a material containing a predetermined radionuclide, for example, I-125, I-131, Yb-169 or other source of radiation, such as radionuclides that emit photons, beta particles, gamma radiation, or other therapeutic rays. The radioactive material contained within the inner chamber **32** can be a fluid made from any solution of radionuclide(s), e.g., a solution of I-125 or I-131. A radioactive fluid can also be produced using a slurry of a suitable fluid containing small particles of solid radionuclides, such as Au-198, Y-90. Moreover, the radionuclide(s) can be embodied in a gel. One radioactive material useful in the invention is Iotrex™, a sterile single use, non-pyrogenic solution containing sodium 3-(^{125}I)iodo-4-hydroxybenzenesulfonate (^{125}I-IIBS), available from Proxima Therapuetics, Inc. of Alpharetta, Ga.

As an alternative method of providing radioactive source material, such material may be coated on, chemically bonded to, or copolymerized with the material forming inner spherical wall **32**.

Where the radioactive source material is provided as a fluid or gel within inner spherical wall **32**, it may be desirable to provide a solid outer spherical wall **36**. Should inner spherical wall **32** rupture, the radioactive source material will be retained within outer spherical wall **36** and will not leak into the patient. For further safety, the burst strength of inner spherical wall **32** may be designed so as to be lower than that of outer spherical wall **36**. In this way, inner spherical wall **32** will rupture under stress first, releasing its contents into the larger combined space of the inner and outer volumes **30**, **34** and releasing any pressure built up within the inner spherical wall **32** and reducing the risk that radioactive material will spill into the patient. In the event of such a rupture, radioactive fluid could be drained from the apparatus through port **24** by way of lumen **14**, and also from port **26** by way of lumen **16**.

In a further embodiment, illustrated in FIG. **3**, instead of having the inner spatial volume **30** defined by a generally spherical polymeric film wall as at **32**, the catheter body member **12** may have a solid spherical radiation emitting material **44** as the inner spatial volume **30**. For example, radioactive micro spheres of the type available from the 3M Company of St. Paul, Minn., may be used. This radioactive source can either be preloaded into the catheter at the time of manufacture or loaded into the device after it has been implanted into the space formerly occupied by the excised tumor. The solid radiation emitting material **44** can be inserted through catheter **12** on a wire **46**, for example, using an afterloader (not shown). Such a solid radioactive core configuration offers an advantage in that it allows a wider range of radionuclides than if one is limited to liquids. Solid radionuclides that could be used with the delivery device of the present invention are currently generally available as brachytherapy radiation sources. In this embodiment solid spherical inner spatial volume **30** is surrounded by outer spherical wall **36**, defining outer spatial volume **34** between the outer spherical wall **36** and the inner spatial volume **30** with the outer spatial volume **34** occupied by a radioactive ray absorbent material, such as air, water or a contrast material.

In a further embodiment, illustrated in FIG. 4, inner spatial volume **30**, instead of comprising a single solid sphere, may comprise a plurality of radiation emitting particles **44** strategically placed within the inner spatial volume **30** so as to radiate in all directions with a substantially equal intensity. This plurality of radiation emitting particles **44** can be mounted on the distal ends of a plurality of wires **46** that are routed through the catheter body **12** and exit a plurality of ports formed through the wall of the catheter body and reaching the lumen. This arrangement allows the exact positioning of the individual radiation sources **44** to be positioned so as to generate a desired resultant profile.

As illustrated in FIG. **5**, it is not essential to the invention that the volumes **30** and **34** have spherical walls, so long as the resultant dosing profile is consistent with the shape of the outer volume **34**. That is, the absorbed dose within the target tissue at points equidistant from the surface **36** of the outer spatial volume **34** should be substantially uniform in substantially every direction. Put another way, the three dimensional isodose profiles generated by the radiation source should be substantially similar in shape to the outer spatial volume **34**. Where the inner and outer spatial volumes are created by inflatable membranes and one of the volumes contains a fluid radiation source, this can be achieved by ensuring that the spacing between the wall of the inner volume and the wall of the outer volume remain generally constant. In either the concentric spherical embodiment of FIG. **1** or the non-spherical configuration of FIG. **5**, this result can be achieved by careful placement of precision blown or molded polymer partitions or by using compressible foams or mechanical spacers in the form of webs joining the inner wall **32** to the outer wall **36**. The desired isodose profiles conforming to the shape of the outer spatial volume **34** can also be obtained, for example, by strategic placement of a plurality of radioactive particle sources within the inner spatial volume **30**. Where the apparatus of the invention is deployed in soft tissue, it may also be important for the surface **36** of the outer spatial volume **34** to be sufficiently firm so as to force the target tissue to take on the shape of the surface **36** so that the desired relationship between the isodose profiles and the target tissue is achieved.

When used in an interstitial application, the surface of the outer spatial volume **34** must establish a relationship between the inner spatial volume **30** and the target tissue so as to achieve the aforementioned isodose profile, however, the surface of the outer volume need not be a solid material. For example, as illustrated in FIG. **6**, the surface of the outer volume **34** could be an expandable cage **48** formed from a shape memory metal, such as nitinol, or a suitable plastic, such as an expandable polyethylene cage. Such a cage can be formed in the desired shape to conform to a particular isodose profile, then be contracted for delivery to the target site in vivo, then expanded to cause the tissue surrounding the surgically resected region to take the appropriate shape. The size of the outer spatial volume **34** generally will correspond approximately to the amount of tissue resected, or be slightly larger, allowing the expandable surface of the outer spatial volume to urge tissue on the surface of the resected region into the appropriate shape to promote an even dose distribution around the outer spatial volume in the target tissue. In typical applications, the outer spatial volume has a diameter of approximately 2 to 4 centimeters. In these same applications, where the radiation source is provided as a fluid within an inner balloon, the inner balloon generally has a diameter of approximately 0.5 to 3 centimeters.

FIGS. 7A–D illustrate the ability of an interstitial brachytherapy apparatus of the invention to deliver a minimum prescribed dose within target tissue while avoiding necrosis inducing radiation "hot spots" in tissue proximate to the apparatus. FIG. **7A** illustrates an interstitial brachytherapy apparatus (device A) such as those employed in U.S. Pat. No. 5,429,582, having a single spatial volume **50** filled with a radioactive material in solution. FIG. **7B** illustrates an interstitial brachytherapy apparatus (device B) of the invention having a first, inner spatial volume **30** filled with a radioactive material in solution and defined by membrane **32**, and a second, outer spatial volume **34** defined by membrane **36** that is substantially evenly spaced apart from membrane **32** in substantially three dimensions. FIG. **7C** illustrates an additional interstitial brachytherapy apparatus (device C) of the invention having a solid, spherical radiation source **44** as the inner spatial volume and a spherical outer spatial volume **34** defined by membrane **36**.

Each of the devices illustrated in FIGS. **7A–C** can be configured to deliver a substantially uniform dose at a given distance into the target tissue from the surface of the outer spatial volume **34** (or from single spatial volume **50** for device A) and to deliver a minimum prescribed dose within a given prescribed depth range into the tissue from the surface of the outer spatial volume **34**. However, the different devices provide very different dose profiles as a function of distance from the surface of the outer volume as illustrated in FIG. **7D**. FIG. **7D** plots the absorbed dose at a given distance into the target tissue from the surface of the outer spatial volume **34** for each of the devices A, B, and C.

Each device can deliver a minimum prescribed dose **52** at a given distance from the surface of the outer spatial volume. For example, device A can readily be configured to provide a dose in a therapeutic range, say between 40 to 60 Gray, at a distance between 0.5 and 1.0 cm from the outer spatial volume for an outer spatial volume having a diameter of 4.0 cm and being in contact with the resection cavity wall. In a typical embodiment, the radioactive source material ranges from approximately 150 to 450 mCi in activity and encompasses most of the target treatment area with a 0.4 to 0.6 Gray/hour isodose contour. At this treatment rate, treatment may be completed in approximately 3 to 7 days, or more commonly, in approximately 3 to 5 days.

In order to reach the minimum prescribed dosage at this distance, however, device A must provide a dose proximate to the surface of the outer spatial volume that is substantially larger than the minimum prescribed dose. For the 4.0 cm diameter outer spatial volume example, the absorbed dosage would be approximately 131 Gray at the outer spatial volume surface. Ideally, radiation therapy should make use the inherent difference in radiosensitivity between the tumor and the adjacent normal tissues to destroy cancerous tissue while causing minimal disruption to surrounding normal tissues. At high doses of radiation, however, the percentage of exposed cells that survive treatment decreases with first-order kinetics in proportion to increasing radiation dose. With increasing cell death comes increasing risk of necrosis or tissue death in healthy tissue that is treated with a high dose of radiation. Accordingly, it is desirable to keep the maximum radiation dose delivered by the brachytherapy apparatus as low as possible while still delivering the desired therapeutic dose to the desired range of tissue.

Comparing the plots A, B, and C, the absorbed dose profile in the space between the 2 cm site and the surface of the outer spatial volume for the devices of the invention is maintained in a much narrower range, preventing over-treatment of body tissue at or close to the surface of the outer volume of the device. Because devices B and C provide an outer spatial volume **34** between the radioactive source and

the target tissue, these devices can use hotter radiation sources to reach the minimum prescribed dosage, but take advantage of the distance between the radioactive source and the target tissue provided by the outer spatial volume **34** to reduce or eliminate hot spots in the target tissue.

Returning to the 4.0 cm diameter outer spatial volume example, if the radiation source is contained within an inner spatial volume, say a solid radioactive sphere such as device C, the absorbed dose profile becomes much different. If the radiation source is configured to provide the same 60 Gray dose at 0.5 cm into the target tissue, the absorbed dose at the outer spatial volume surface is only 94 Gray—a significant decrease from the 131 Gray dose for a type A device. In addition, the treatment range for the type C device will be extended under these circumstance as compared to the type A device, delivering a 40 Gray dose beyond 1.0 cm into the target tissue and delivering approximately double the dose at 3.0 cm into the target tissue. In one embodiment, the inner and outer spatial volumes are configured to control the absorbed dose at the outer spatial volume surface so that the absorbed dose is no greater than about 100 Gray while providing a therapeutic absorbed dose into the target tissue at the desired range. The capability of the apparatus of the invention to deliver absorbed doses deeper into the target tissue than prior interstitial brachytherapy devices while controlling the dose in proximity to the apparatus to reduce or eliminate the risk of healthy tissue necrosis allows for the use of brachytherapy in a greater number of cases.

The interstitial brachytherapy apparatus of the invention can be used in the treatment of a variety of malignant tumors, and is especially useful for in the treatment of brain and breast tumors.

Many breast cancer patients are candidates for breast conservation surgery, also known as lumpectomy, a procedure that is generally performed on early stage, smaller tumors. Breast conservation surgery is typically followed by postoperative radiation therapy. Studies report that 80% of breast cancer recurrences after conservation surgery occur near the original tumor site, strongly suggesting that a tumor bed "boost" of local radiation to administer a strong direct dose may be effective in killing any remaining cancer and preventing recurrence at the original site. Numerous studies and clinical trials have established equivalence of survival for appropriate patients treated with conservation surgery plus radiation therapy compared to mastectomy.

Surgery and radiation therapy are the standard treatments for malignant solid brain tumors. The goal of surgery is to remove as much of the tumor as possible without damaging vital brain tissue. The ability to remove the entire malignant tumor is limited by its tendency to infiltrate adjacent normal tissue. Partial removal reduces the amount of tumor to be treated by radiation therapy and, under some circumstances, helps to relieve symptoms by reducing pressure on the brain.

A method according to the invention for treating these and other malignancies begins by surgical resection of a tumor site to remove at least a portion of the cancerous tumor and create a resection cavity. Following tumor resection, but prior to closing the surgical site, the surgeon intraoperatively places an interstitial brachytherapy catheter apparatus, having an inner spatial volume and an outer spatial volume as described above but without having the radioactive source material loaded, into the tumor resection cavity. Once the patient has sufficiently recovered from the surgery, the interstitial brachytherapy catheter is loaded with a radiation source. The radioactive source dwells in the catheter until the prescribed dose of radiotherapy is delivered, typically for approximately a week or less. The radiation source is then retrieved and the catheter is removed. The radiation treatment may end upon removal of the brachytherapy apparatus, or the brachytherapy may be supplemented by further doses of radiation supplied externally.

It will be understood that the foregoing is only illustrative of the principles of the invention, and that various modifications can be made by those skilled in the art without departing from the scope and spirit of the invention. All references cited herein are expressly incorporated by reference in their entirety.

What is claimed is:

1. An interstitial brachytherapy apparatus for delivering radioactive emissions to an internal body location comprising:

(a) a catheter body member having a proximal end and distal end;

(b) an inner spatial volume disposed proximate to the distal end of the catheter body member;

(c) an outer spatial volume defined by an expandable surface element disposed proximate to the distal end of the body member in a surrounding relation to the inner spatial volume; and

(d) a radiation source disposed in the inner spatial volume and generating a three-dimensional isodose profile that is substantially similar in shape to the expandable surface element.

2. The apparatus of claim **1**, wherein the inner and outer spatial volumes are configured to provide a minimum prescribed absorbed dose for delivering therapeutic effects to a target tissue, the target tissue being defined between the outer spatial volume expandable surface and a minimum distance outward from the outer spatial volume expandable surface, the apparatus providing a controlled dose at the outer spatial volume expandable surface to reduce or prevent necrosis in healthy tissue proximate to the expandable surface.

3. The apparatus of claim **2**, wherein a predetermined spacing is provided between said inner spatial volume and the expandable surface element.

4. The apparatus of claim **3**, wherein the expandable surface element is adapted to contact tissue surrounding a resected cavity and adapted to conform the tissue to the desired shape of the expandable surface element.

5. The apparatus of claim **2**, wherein the minimum prescribed absorbed dose is 40 Gray at a distance of at least one centimeter from the expandable surface element.

6. The apparatus of claim **5**, wherein the dose rate in at least a portion of the target tissue is between about 0.4 and 0.6 Gray/hour.

7. The apparatus of claim **5**, wherein the maximum absorbed dose delivered to the target tissue is less than 100 Gray.

8. The apparatus of claim **2**, wherein the outer spatial volume has a diameter between about two and four centimeters.

9. The apparatus of claim **2**, wherein the inner spatial volume is an inner closed, distensible chamber defined by a further radiation transparent wall.

10. The apparatus of claim **9**, wherein the radioactive source is in a fluid form.

11. The apparatus of claim **10**, wherein the expandable surface element is a solid distensible surface and the outer spatial volume is a closed, distensible chamber and the expandable surface element is a radiation transparent wall.

12. The apparatus of claim 11, wherein a burst strength of the distensible chamber defining the outer spatial volume is greater than a burst strength of the chamber defining the inner spatial volume.

13. The apparatus of claim 1, wherein the expandable surface element is an expandable cage.

14. The apparatus of claim 13, wherein the expandable cage comprises a shape memory material.

15. The apparatus of claim 14, wherein the expandable cage comprises nitinol.

16. The apparatus of claim 1, wherein the radiation source is a solid radiation source.

17. The apparatus of claim 1, wherein the radiation source is a plurality of solid radiation sources arranged to provide an isodose profile having a shape substantially similar to the shape of the outer spatial volume.

18. The apparatus of claim 2, wherein the prescribed absorbed dose is delivered to the target tissue in substantially three dimensions.

19. A method for treating a proliferating tissue disease using interstitial brachytherapy at an internal body location comprising:

(a) surgically creating access to the proliferating tissue in a patient;

(b) surgically resecting at least a portion of the proliferating tissue to create a resection cavity within body tissue;

(c) providing an interstitial brachytherapy apparatus for delivering radioactive emissions comprising:

(i) a catheter body member having a proximal end and distal end;

(ii) an inner spatial volume disposed proximate to the distal end of the catheter body member;

(iii) an outer spatial volume defined by an expandable surface element disposed proximate to the distal end of the body member in a surrounding relation to the inner spatial volume; and

(iv) a radiation source disposed in the inner spatial volume and generating a three-dimensional isodose profile that is substantially similar in shape to the expandable surface element;

(d) intraoperatively placing the interstitial brachytherapy apparatus into the resection cavity until a prescribed absorbed dose has been delivered to tissue surrounding the apparatus; and

(e) removing the interstitial brachytherapy apparatus.

20. The method of claim 19, further including placing the radioactive source into the interstitial brachytherapy apparatus after the step of placing the apparatus into the tumor resection cavity.

21. The method of claim 19, further including removing the radioactive source from the interstitial brachytherapy apparatus before the step of removing the apparatus.

22. The method of claim 19, wherein the proliferating tissue is a patient's brain.

23. The method of claim 19, wherein the proliferating tissue is a patient's breast.

24. The method of claim 19, further including configuring the inner and outer spatial volumes to provide a minimum prescribed absorbed dose for delivering therapeutic effects to a target tissue, the target tissue being defined between the outer spatial volume expandable surface and a minimum distance outward from the outer spatial volume expandable surface, the apparatus providing a controlled dose at the outer spatial volume expandable surface to reduce or prevent necrosis in healthy tissue proximate to the expandable surface.

25. The method of claim 24, further including providing a predetermined spacing between said inner spatial volume and the expandable surface element.

26. The method of claim 25, wherein the expandable surface element is adapted to contact tissue surrounding a resected cavity and adapted to conform the tissue to the desired shape of the expandable surface element.

27. The method of claim 24, wherein the minimum prescribed absorbed dose is 40 Gray at a distance of at least one centimeter from the expandable surface element.

28. The method of claim 27, wherein the dose rate in at least a portion of the target tissue is between about 0.4 and 0.6 Gray/hour.

29. The method of claim 27, wherein the maximum absorbed dose delivered to the target tissue is less than 100 Gray.

30. The method of claim 24, wherein the outer spatial volume has a diameter between about two and four centimeters.

31. The method of claim 24, wherein the step of configuring the inner and outer spatial volumes includes expanding the inner and outer spatial volumes.

32. A method for treating a proliferating tissue disease using interstitial brachytherapy at an internal body location comprising:

(a) surgically creating access to the proliferating tissue in a patient;

(b) surgically resecting at least a portion of the proliferating tissue to create a resection cavity within body tissue;

(c) providing an interstitial brachytherapy apparatus for delivering radioactive emissions comprising:

(i) a catheter body member having a proximal end and distal end;

(ii) an inner spatial volume disposed proximate to the distal end of the catheter body member;

(iii) an outer spatial volume defined by an expandable surface element disposed proximate to the distal end of the body member in a surrounding relation to the inner spatial volume; and

(iv) a radiation source disposed in the inner spatial volume;

(d) intraoperatively placing the interstitial brachytherapy apparatus into the resection cavity;

(e) configuring the inner and outer spatial volumes to provide a minimum prescribed absorbed dose for delivering therapeutic effects to a target tissue, the target tissue being defined between the outer spatial volume expandable surface and a minimum distance outward from the outer spatial volume expandable surface, the apparatus providing a controlled dose at the outer spatial volume expandable surface to reduce or prevent necrosis in healthy tissue proximate to the expandable surface; and

(f) removing the interstitial brachytherapy apparatus.

33. The method of claim 32, wherein the step of configuring the inner and outer spatial volumes includes expanding the inner and outer spatial volumes.

34. A method for treating a proliferating tissue disease using interstitial brachytherapy at an internal body location comprising:

(a) surgically creating access to the proliferating tissue in a patient;

(b) surgically resecting at least a portion of the proliferating tissue to create a resection cavity within body tissue;

(c) providing an interstitial brachytherapy apparatus for delivering radioactive emissions comprising:

(i) a catheter body member having a proximal end and distal end;

(ii) an inner spatial volume disposed proximate to the distal end of the catheter body member;

(iii) an outer spatial volume defined by an expandable surface element disposed proximate to the distal end of the body member in a surrounding relation to the inner spatial volume; and

(iv) a radiation source disposed in the inner spatial volume;

(d) intraoperatively placing the interstitial brachytherapy apparatus into the resection cavity;

(e) adapting the expandable surface element to contact tissue surrounding the resection cavity to conform the tissue to the desired shape of the expandable surface element;

(f) delivering a prescribed absorbed dose to tissue surrounding the apparatus; and

(g) removing the interstitial brachytherapy apparatus.

35. The method of claim **34**, wherein the step of adapting the expandable surface element includes expanding the outer surface volume.

36. An interstitial brachytherapy apparatus for delivering radioactive emissions to an internal body location comprising:

(a) a catheter body member having a proximal end and distal end;

(b) an inner spatial volume disposed proximate to the distal end of the catheter body member;

(c) an outer spatial volume defined by an expandable surface element disposed proximate to the distal end of the body member in a surrounding relation to the inner spatial volume; and

(d) a radiation source disposed in the inner spatial volume;

wherein the inner and outer spatial volumes are configured to provide a minimum prescribed absorbed dose for delivering therapeutic effects to a target tissue, the target tissue being defined between the outer spatial volume expandable surface and a minimum distance outward from the outer spatial volume expandable surface, the apparatus providing a controlled dose at the outer spatial volume expandable surface to reduce or prevent necrosis in healthy tissue proximate to the expandable surface.

* * * * *

Exhibit 3

US006482142B1

(12) **United States Patent**
Winkler et al.

(10) **Patent No.: US 6,482,142 B1**
(45) **Date of Patent: Nov. 19, 2002**

(54) **ASYMMETRIC RADIATION DOSING APPARATUS AND METHOD**

(75) Inventors: **Rance A. Winkler**, Atlanta; **Timothy J. Patrick**, Alpharetta, both of GA (US)

(73) Assignee: **Proxima Therapeutics, Inc.**, Alpharetta, GA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/464,727**

(22) Filed: **Dec. 16, 1999**

Related U.S. Application Data

(63) Continuation-in-part of application No. 09/293,524, filed on Apr. 15, 1999, which is a continuation-in-part of application No. 08/900,021, filed on Jul. 24, 1997, now Pat. No. 5,913,813.

(51) **Int. Cl.**[7] **A61N 5/00**
(52) **U.S. Cl.** **600/3**
(58) **Field of Search** 600/1–8

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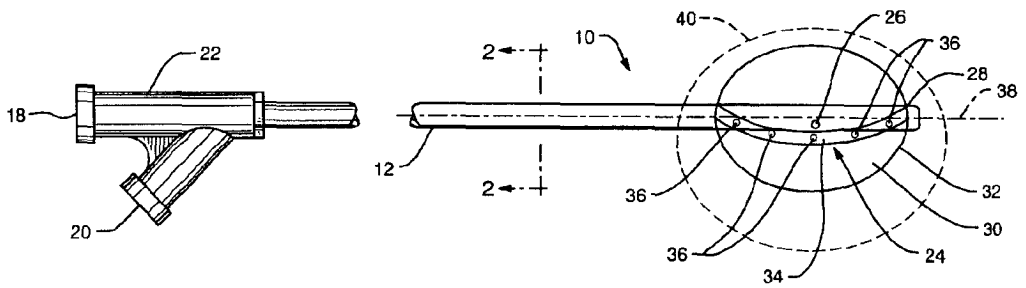
Primary Examiner—John P. Lacyk
(74) *Attorney, Agent, or Firm*—Thomas J. Engellenner; Ronald E. Cahill; Nutter McClennen & Fish LLP

(57) **ABSTRACT**

An interstitial brachytherapy apparatus of the invention delivers radioactive emissions in an asymmetric fashion to target tissue surrounding a surgical extraction site. The apparatus includes an expandable outer surface element defining an apparatus spatial volume, a radiation source disposed within the apparatus volume, and a means for providing predetermined asymmetric isodose curves within the target tissue. In one configuration, asymmetric isodose curves are created in the target tissue by shaping or locating the radiation source so as to be asymmetrically placed with respect to a longitudinal axis of the apparatus. In other configurations, asymmetric radiopaque shielding is provided between the radiation source and the target tissue. A surgical procedure using the apparatus is also described.

14 Claims, 4 Drawing Sheets



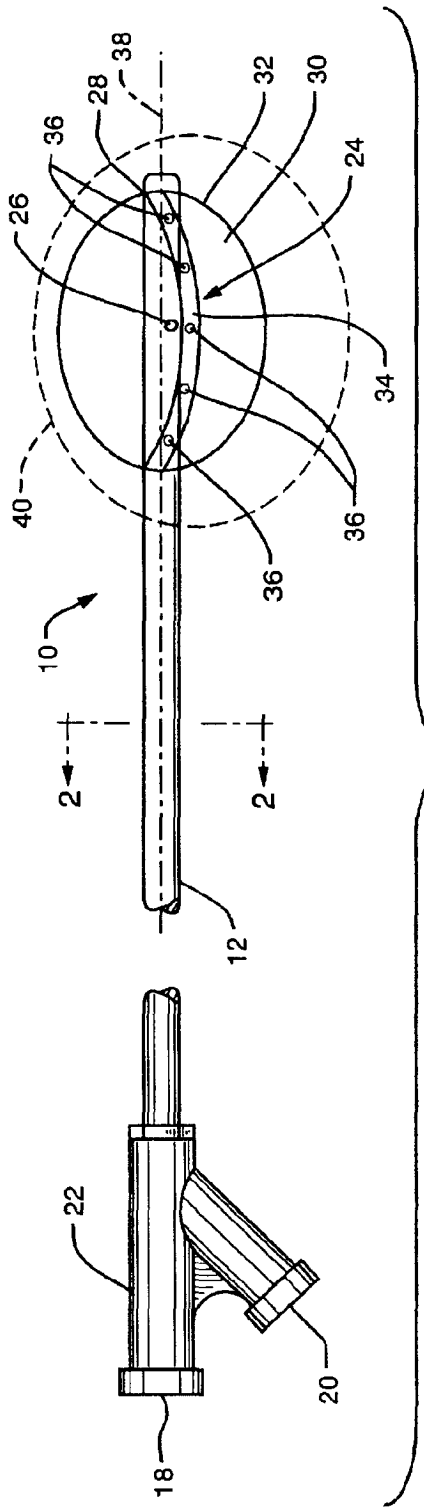


FIG. 1

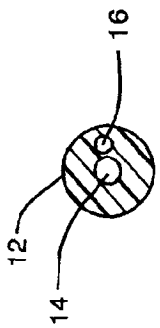


FIG. 2

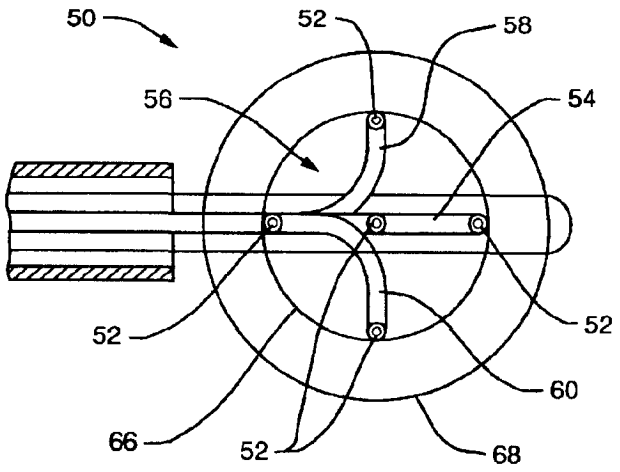


FIG. 3

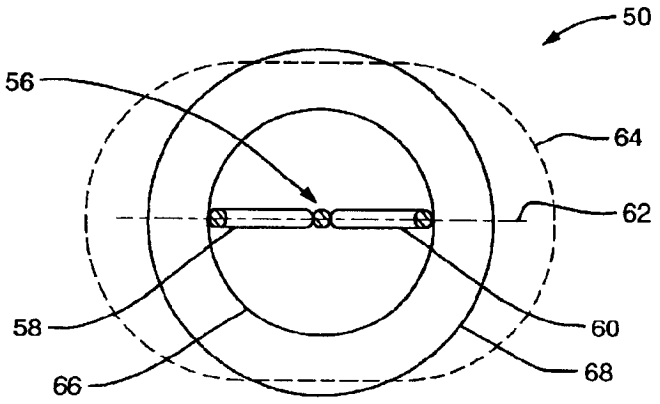


FIG. 3A

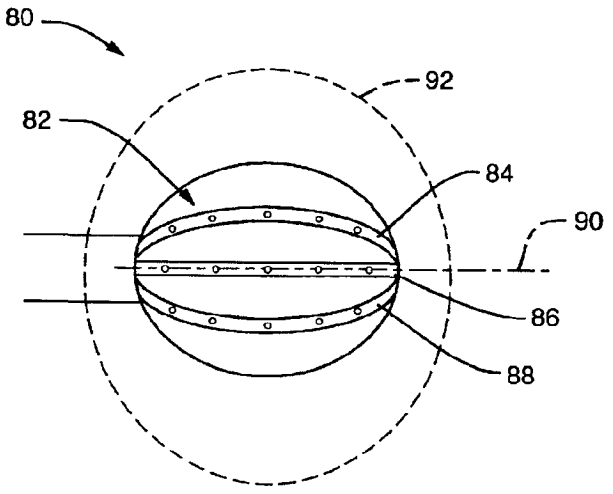


FIG. 4

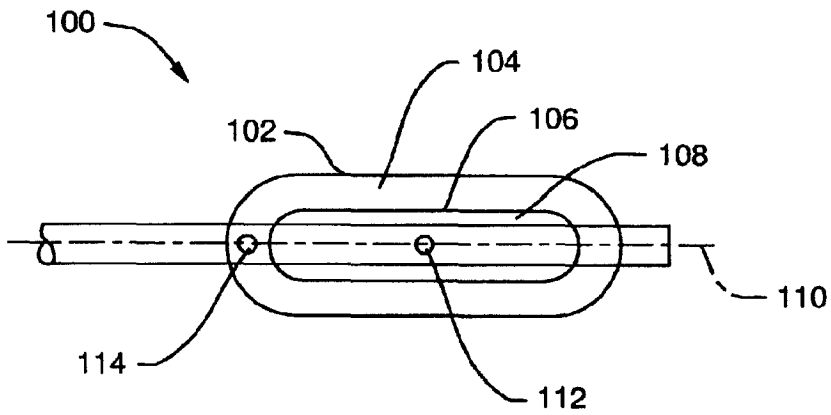

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FIG. 5

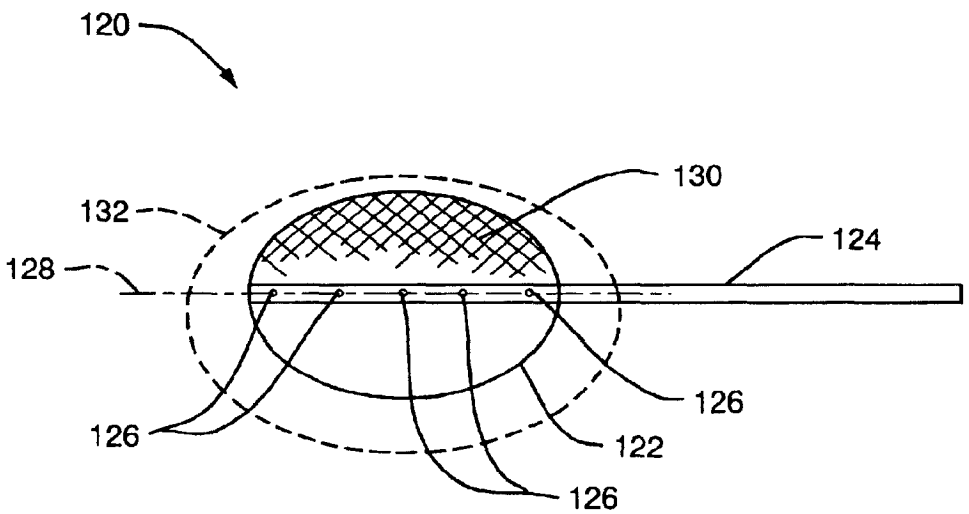
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FIG. 6

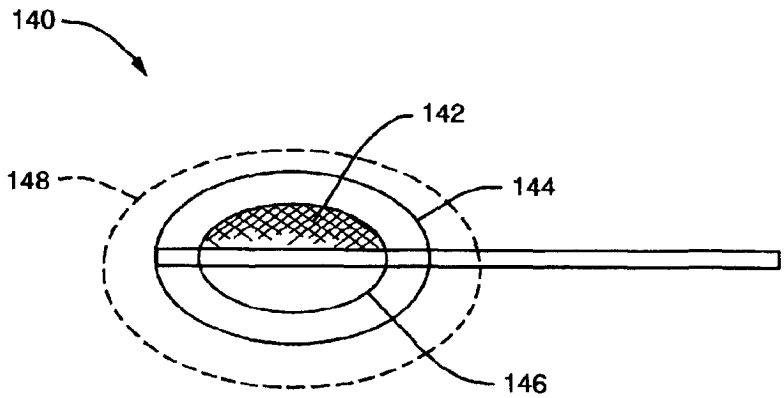

FIG. 7

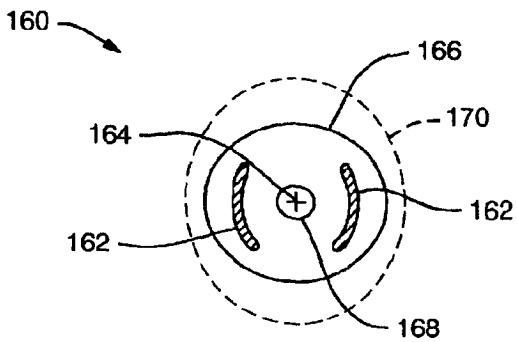

FIG. 8

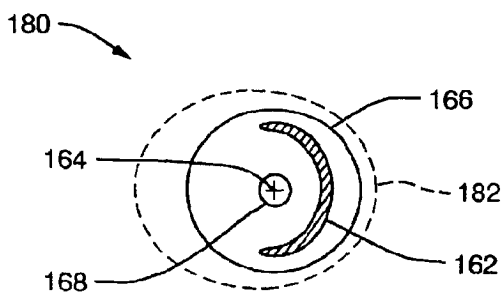

FIG. 9

ASYMMETRIC RADIATION DOSING APPARATUS AND METHOD

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation-in-part of co-pending U.S. patent application Ser. No. 09/293,524, filed Apr. 15, 1999, pending which is a continuation-in-part U.S. patent application Ser. No. 08/900,021, filed Jul. 24, 1997 (now issued as U.S. Pat. No. 5,913,813 to Williams et al.); the contents of these applications are specifically incorporated herein by reference.

BACKGROUND OF THE INVENTION

The, invention relates generally to an apparatus for use in treating proliferative tissue disorders, and more particularly to an apparatus for the treatment of such disorders in the body by the application of radiation.

Malignant tumors are often treated by surgical resection of the tumor to remove as much of the tumor as possible. Infiltration of the tumor cells into normal tissue surrounding the tumor, however, can limit the therapeutic value of surgical resection because the, infiltration can be difficult or impossible to treat surgically. Radiation therapy can be used to supplement surgical resection by targeting the residual tumor margin after resection, with the goal of reducing its size or stabilizing it. Radiation therapy can be administered through one of several methods, or a combination of methods, including external-beam radiation, stereotactic radiosurgery, and permanent or temporary interstitial brachytherapy. The term "brachytherapy," as used herein, refers to radiation therapy delivered by a spatially confined radioactive material inserted into the body at or near a tumor or other proliferative tissue disease site. Owing to the proximity of the radiation source, brachytherapy offers the advantage of delivering a more localized dose to the target tissue region.

For example, brachytherapy is performed by implanting radiation sources directly into the tissue to be treated. Brachytherapy is most appropriate where 1) malignant tumor regrowth occurs locally, within 2 or 3 cm of the original boundary of the primary tumor site; 2) radiation therapy is a proven treatment for controlling the growth of the malignant tumor; and 3) there is a radiation dose-response relationship for the malignant tumor, but the dose that can be given safely with conventional external beam radiotherapy is limited by the tolerance or normal tissue. In brachytherapy, radiation doses are highest in close proximity to the radiotherapeutic source, providing a high tumor dose while sparing surrounding normal tissue. Interstitial brachytherapy is useful for treating malignant brain and breast tumors, among others.

Interstitial brachytherapy is traditionally carried out using radioactive seeds such as ^{125}I seeds. These seeds, however, produce inhomogeneous dose distributions. In order to achieve a minimum prescribed dosage throughout a target region of tissue, high activity seeds must be used, resulting in very high doses being delivered in some regions in proximity to the seed or seeds which can cause radionecrosis in healthy tissue. One attempt to address this problem, at least with respect to limiting dosages to critical organs near the radioactive seed site, has been to provide a shield directly on a portion of the seed or on an applicator that holds the seed to shield the particularly sensitive tissue. (E.g., Nath et al., Development of an ^{241}Am Applicator for Intracavitary Irradiation of Gynecologic Cancers, *Intl. J. Radiation Oncology Biol. Phys.*, Vol., 14, pp. 969–978.) While this approach may be appropriate for some applications, it may still be overly "hot" for treating proximate tissue on the unshielded side of the seed, while not providing an effective dose on the shielded side of the seed.

Williams U.S. Pat. No. 5,429,582, entitled "Tumor Treatment," describes a method and apparatus for treating tissue surrounding a surgically excised tumor with radioactive emissions to kill any cancer cells that may be present in the tissue surrounding the excised tumor. In order to implement the radioactive emissions, Williams provides a catheter having an inflatable balloon at its distal end that defines a distensible reservoir. Following surgical removal of a tumor, the surgeon introduces the balloon catheter into the surgically created pocket left following removal of the tumor. The balloon is then inflated by injecting a fluid having one or more radionuclides into the distensible reservoir via a lumen in the catheter.

The apparatus described in Williams solves some of the problems found when using radioactive seeds for interstitial brachytherapy, but leaves some problems unresolved. The absorbed dose rate at a target point exterior to a radioactive source is inversely proportional to the square of the distance between the radiation source and the target point. s a result, where the radioactive source has sufficient activity to deliver a prescribed dose, say 2 centimeters into the target tissue, the tissue directly adjacent the wall of the distensible reservoir, where the distance to the radioactive source is very small, may still be overly "hot" to the point where healthy tissue necrosis may result. In general, the amount of radiation desired by the physician is a certain minimum amount that is delivered to a region up to about two centimeters away from the wall of the excised tumor. It is desirable to keep the radiation that is delivered to the tissue in the target treatment region within a narrow absorbed dose range to prevent over-exposure to tissue at or near the reservoir wall, while still delivering the minimum prescribed dose at the maximum prescribed distance from the reservoir wall. It is also desirable, at least in some applications, to provide these advantages while tailoring the radiation dosage to avoid fully dosing sensitive tissue or to reduce the amount of radiation that escapes the patient's body.

There its still a need for an instrument which can be used to deliver radiation from a radioactive source to target tissue within the human body with a desired intensity and at a predetermined distance from the radiation source without over-exposure of body tissues disposed between the radiation source and the target, and with the ability to shape the radiation dose to protect sensitive tissue or to protect against radiation exposure outside of the patient's body which may affect healthcare providers or others who might come close to the patient.

SUMMARY OF THE INVENTION

The present invention solves the problems described above by providing an interstitial brachytherapy apparatus for delivering radioactive emissions in an asymmnetric fashion to target tissue surrounding a surgical extraction site. The apparatus includes an expandable outer surface element defining an apparatus spatial volume, a radiation source disposed within the apparatus volume, and a means for providing predetermined asymmnetric isodose profile within the target tissue.

In one configuration, asymmetric isodose curves are created in the target tissue by shaping or locating the radiation source so as to be asymmetrically placed with respect to a

longitudinal axis of the apparatus. In one example of an apparatus having this configuration, an inner volume containing a liquid radioisotope is asymmetrically placed within the apparatus volume so as to result in an isodose profile in the target tissue that is asymmetric about the longitudinal axis of the apparatus.

In another example, the radiation source comprises a plurality of spaced apart solid radioactive particles disposed within the apparatus volume and arranged to provide a predetermined asymmetric isodose curve within the target tissue. In one particular example, the plurality of spaced apart radioactive particles are provided on a single elongate member that is shaped so that some of the radioactive particles are farther from the longitudinal axis of the apparatus than others. In other particular examples, a plurality of members carrying radioactive particles are provided with at least one of the members being shaped so as to place at least one radioactive particle asymmetrically with respect to the longitudinal axis of the apparatus.

An interstitial brachytherapy apparatus of the invention may also be implemented in a device having an expandable outer surface defining an apparatus volume, a radiation source disposed within and spaced apart from the expandable outer surface, and at least one asymmnetric radiation shield spaced apart from the radiation source, the asymmetric radiation shielding resulting in predetermined asymmetric isodose curves with in the target tissue. In one embodiment, radiopaque shielding is provided on a portion of the expandable outer surface. In another embodiment, the radiation source is encompassed within a second, inner surface within the apparatus volume, with radiopaque shielding provided on at least a portion of the inner surface. In still further embodiments, one or more radiation shields are spaced apart from the radiation source and within the apparatus volume to achieve the desired asymmetric isodose distribution within the target tissue.

The invention also provides a method for treating a proliferating tissue disease using interstitial brachytherapy at an internal body location. The method includes surgically creating access to the proliferating tissue within a patient and surgically resecting at least a portion of the proliferating tissue to create a resection cavity within body tissue. An interstitial brachytherapy apparatus for delivering radioactive emissions as described above is then provided and intra-operatively placed into the resection cavity. After a prescribed absorbed dose has been delivered to tissue surrounding the apparatus, the apparatus is removed. The radioactive source material may be placed into the interstitial brachytherapy apparatus after the apparatus is placed in the resection cavity, and may be removed before the apparatus is removed. The method has particular applications to brain and breast cancers.

DESCRIPTION OF THE DRAWINGS

The foregoing features, objects and advantages of the invention will become apparent to those skilled in the art from the following detailed description of a preferred embodiment, especially when considered in conjunction with the accompanying drawings in which:

FIG. **1** is a side view of an interstitial brachytherapy apparatus of the invention for delivering asymmetric radioactive doses to body tissue;

FIG. **2** is a cross-sectional view taken along the line 2—2 in FIG. 1;

FIG. **3** is a side view of an additional embodiment of an interstitial brachytherapy apparatus of the invention;

FIG. **3A** is an end view of the interstitial brachytherapy apparatus of FIG. **3**;

FIG. **4** is a side view of an additional embodiment of an interstitial brachytherapy apparatus of the invention;

FIG. **5** is a side view of an interstitial brachytherapy apparatus of the invention configured for use with a liquid radiation source.

FIG. **6** is a side view of an interstitial brachytherapy device of the invention employing radiopaque coatings;

FIG. **7** is a side view of an interstitial brachytherapy device of the invention employing radiopaque coating and a liquid radiation source; and

FIGS. **8** and **9** are end views of interstitial brachytherapy devices of the invention employing radiopaque shields.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A surgical instrument **10** for providing radiation treatment to proliferative tissue in a living patient is illustrated in FIG. **1**. Surgical instrument **10** includes a tubular body member **12** having first and second lumens **14** and **16** (FIG. **2**) extending from proximal ports **18** and **20** in a molded hub **22**. The first lumen **14** carries a radioactive source **24** and second lumen **16** communicates with inflation port **26** formed through the side wall of the tube **12**.

Affixed to the tubular body **12** proximate the distal end **28** thereof is an outer spatial volume **30** defined by an outer polymeric film barrier **32** that is appropriately spaced from the radioactive source **24**. Outer volume **30** encompasses inflation port **26**. With no limitation intended, the distensible polymeric film walls may comprise a biocompatible, radiation resistant polymer, such as silastic rubbers, polyurethanes, polyethylene, polypropylene, polyester, or PVC. The outer spatial volume **30** may be filled with air, saline or, alternatively, a radiation absorbing fluid, such as a contrast media used in angiography. Alternatively, the surface of outer volume **30** need not be a solid material. For example the surface of the outer volume **30** could be an expandable cage formed from a shape memory metal, such as nitinol, or a suitable plastic, such as an expandable polyethylene cage. Such a cage can be formed in the desired shape to conform to a particular isodose profile, contracted for delivery to the target site in vivo, then expanded to cause the tissue surrounding the surgically resected region to take the appropriate shape. The size of the outer spatial volume **30** generally will correspond approximately to the amount of tissue resected. For some applications, the size of the outer spatial volume **30** may be slightly smaller than the resected volume while for other applications, the outer spatial volume will be slightly larger than the resected volume, allowing the expandable surface of the outer spatial volume to urge tissue on the surface of the resected region into the appropriate shape to promote an even dose distribution around the outer spatial volume in the target tissue. In typical applications, the outer spatial volume has a diameter of approximately 2 to 6 centimeters.

Radiation source **24** comprises a wire **34** having one or more solid radioactive particles **36** located on the wire **34**. For example, radioactive micro spheres of the type available from the 3M Company of St. Paul, Minn., may be used as the solid radioactive particles. Such a solid radioactive particle configuration offers an advantage in that it allows a wider range of radionuclides than if one is limited to liquids. Solid radionuclides that could be used with the delivery device of the present invention are currently generally available as brachytherapy radiation sources. Examples of

radioactive materials which can be selected by a person of ordinary skills in the art for use with the present invention may be found in Tables 1 to 4 of PCT Publication WO 97/19723, which is hereby incorporated by reference.

The, radioactive source **24** can either be preloaded into the catheter at the time of manufacture, or loaded into the device after it has been implanted into the space formerly occupied by the excised tumor. If loaded after implantation, the solid radiation emitting material **36** can be inserted through lumen **14** on a wire **34**, for example using an afterloader (not shown).

Radiation source **24** has an asymmetric configuration with respect to a longitudinal axis **38** of the instrument **10**. That is, radiation source **24** is shaped so as to result in an isodose profile **40** that varies radially about the longitudinal axis **38**. More simply, the isodose profile **40** of FIG. **1** has a shorter radius from the longitudinal axis **38** on the top side of the instrument **10** as shown in FIG. **1** than on the bottom side. The asymmetrically shaped isodose curve **40** may be created by providing a plurality of solid radioactive particles **36** on a curved wire **34** in a spaced apart relationship. This configuration will result in certain of the solid radioactive particles **36** being farther from the longitudinal axis **38** of the instrument **10** than others, and will result in the illustrated asymmetric isodose profile **40**. One way to provide the illustrated radioactive source **24** configuration is to form wire **34** from a solid or tubular shape memory alloy such as nickel-titanium alloys known in the art to have such properties. Wire **34** can then be preformed to the desired shape, can be compressed into a substantially straight configuration to pass through lumen **14**, and will resume its desired shape once inside volume **30** where wire **34** will be free from steric constraints imposed inside the lumen **14**. The resulting asymmetric isodose curve **40** can be further tailored by using solid radioactive particles **36** having differing specific activities to achieve the desired dosing.

In,one embodiment, volume **30** and barrier **32** act to separate target tissue from the radiation source **24**. Ideally, radiation therapy should make use the inherent difference in radiosensitivity between the tumor and the adjacent normal tissues to destroy cancerous tissue while causing minimal disruption to surrounding normal tissues. At high doses of radiation, however, the percentage of exposed cells that survive treatment decreases with first-order kinetics in proportion to increasing radiation dose. With increasing cell death comes increasing risk of necrosis or tissue death in healthy tissue that is treated with a high dose of radiation. Accordingly, it is desirable to keep the maximum radiation dose delivered by the brachytherapy apparatus as low as possible while still delivering the desired therapeutic dose to the desired range of tissue. One method for achieving this result is to provide a "hotter" radiation source in a spaced apart relationship to the target tissue. In this way, because the intensity of the radiation emitted by a source drops with the square of the distance from the source, the effective dosage may be maintained below necrosis levels in target tissue closest to the interstitial brachytherapy apparatus while providing the required dosage to a greater depth into the target tissue. (See, e.g., U.S. Pat. No. 5,913,813 which is hereby incorporated by reference in its entirety.) The capability of the apparatus of the invention to deliver absorbed doses deeper into the target tissue than prior interstitial brachytherapy devices while controlling the dose in proximity to the apparatus to reduce or eliminate the risk of healthy tissue necrosis allows for the use of brachytherapy in a greater number of cases.

For example, it is desirable to provide an interstitial brachytherapy device configured to provide a dose in a therapeutic range, say between 40 to 60 Gray, at a distance between 0.5 and 1.0 cm from the outer spatial volume for an outer spatial volume having a diameter of 4.0 cm and being in contact with the resection cavity wall. In a typical embodiment, the radioactive source material ranges from approximately 150 to 450 mCi in activity and encompasses most of the target treatment area with a 0.4 to 0.6 Gray/hour isodose contour. At this treatment rate, treatment may be completed in approximately 3 to 7 days, or more commonly, in approximately 3 to 5 days.

In some applications, the desired dosing profile is consistent with the shape of the outer volume **30**. That is, the absorbed dose within the target tissue at points equidistant from the surface **32** of the outer spatial volume **30** should be substantially uniform in substantially every direction. Put another way, the three dimensional isodose profiles generated by the radiation source should be substantially similar in shape to the outer spatial volume **30**. Where the apparatus of the invention is deployed in soft tissue, it may also be important for the surface **32** of the outer spatial volume **30** to be sufficiently firm so as to force the target tissue to take on the shape of the surface **30** so that the desired relationship between the isodose profiles and the target tissue is achieved

While the interstitial brachytherapy device **10** of FIG. **1** may employ these techniques to positive effect, this device specifically alters the isodose profile for applications where particularly sensitive tissue or other concerns result in a desire to limit the dosage on one or more sides of the device as illustrated by isodose curve **40**.

In a further embodiment of the brachytherapy device **50** of the invention, illustrated in FIG. **3**, three solid radiation particles **52** are provided in a linear portion **54** of radiation source **56**, while two additional radiation particles **52** are provided on co-planar extending portions **58**, **60** of radiation source **56**. An end view of the device **50** of FIG. **3** is shown in FIG. 3A with extending portions **58**, **60** provided in a single plane **62**, and resulting in isodose profile **64**. A second inner, expandable surface **66** can also be provided within outer surface **68**; the inner surface **66** enclosing the entirety of radiation source **56**.

By providing extending portions **58**, **60** having radioactive particles in the indicated co-planar relationship, areas of reduced dosage can be created on opposed sides of the device while maintaining symmetric dosing in all other directions. Of course, the number of sources and their configuration can be changed to create a desired asymmetric dosage. For example, an additional source could be added, for example above plane **62**, to result in a symmetric isodose profile in all directions except the direction below the plane **62** which would have a lower dosage.

An additional device **80** of the invention, shown in FIG. **4**, includes a radiation source **82** that is made up of three wires **84**, **86**, **88**, each having a plurality of solid radiation particles. Wire **86** is a straight wire extending along the longitudinal axis **90** of the device, while wires **84**, **88** each curve as wire **34** described above with respect to FIG. **1**. Wires **84**, **88** are coplanar, resulting in an isodose profile **92** that is similar to isodose profile **64** of FIG. 3A. That is, the isodose profile will be symmetric in the plane in which the wires **84**, **88** are disposed, but will have areas of reduced dosage in directions transverse to that plane (i.e., in FIG. **4**, in the directions into and out of the page). As with the device **50** of FIGS. **3** and 3A, device **80** can be configured with more or fewer wires **84**, **86**, **88**, and can be provided in configurations other than the depicted co-planar configuration in order to achieve desired asymmetric isodose profiles.

The asymmetric dosing effect achieved by the devices described above can also be achieved using a liquid radiation source. For example, device **100**, illustrated in FIG. **5**, has an outer surface **102** defining an outer volume **104** and an inner surface **106** defining an inner volume **108**. The inner surface **106** is asymmetrically shaped or located with respect to the longitudinal axis **110** of the device **100** so as to result in the desired asymmetric dosing when the inner volume **108** is filled with a radioactive fluid. The inner volume **108** is spaced apart from the outer surface **102** and can be filled with a material containing a predetermined radionuclide, for example, I-125, I-131, Yb-169 or other source of radiation, such as radionuclides that emit photons, beta particles, gamma radiation, or other therapeutic rays. The radioactive material contained within the inner volume **108** can be a fluid made from any solution of radionuclide(s), e.g., a solution of Ir-192, I-125 or I-131. A radioactive fluid can also be produced using a slurry of a suitable fluid containing small particles of solid radionuclides, such as Au-198, Y-90. Moreover, the radionuclide(s) can be embodied in a gel. One radioactive material useful in the invention is Iotrex™, a sterile single use, non-pyrogenic solution containing sodium 3-(^{125}I)iodo-4-hydroxybenzenesulfonate (^{125}I-HIBS), available from Proxima Therapeutics, Inc. of Alpharetta, Ga. The inner volume **108** may be filled with radioactive fluid through port **112**. Similarly, outer volume **104** can be filled on inflated using port **114**.

A desired asymmetric dosing profile having the dosing characteristics described above may also be created by using asymmetric shielding between the radiation source and the target tissue as illustrated in FIGS. **6** through **9**. In the device **120** of FIG. **6**, a balloon **122** is located on the distal end of catheter **124**. Radioactive particles **126** are disposed along the longitudinal axis **128** of the device. A portion of the surface, either inner or outer, of balloon **122** is coated with a radiopaque material **130** to result in asymmetric isodose curve **132**. Radiopaque materials suitable for coating onto a polymeric surface of balloon **122** include, for example, barium, tungsten, bismuth, tantalum and tin.

A further device **140** having radiopaque shielding **142** is illustrated in FIG. **7**. Device **140** includes an outer volume surface **144** and an inner volume surface **146**. Inner surface **146** may contain a liquid radiation source, or may enclose one or more solid particles as used in device **120** (FIG. **6**). In device **140**, the radiopaque material **142** is coated onto a portion of either the inner or outer side of the inner volume surface **146**, resulting in a desired asymmetric isodose profile **148**.

Additional devices **160**, **180** of the invention having radiation shielding **162** are illustrated in FIGS. **8** and **9**, respectively. In these devices **160**, **180**, one or more radiation shields **162** are provided between and spaced apart from a radiation source (not shown) located along a longitudinal axis **164** of the device and the target tissue, which will be located outside of expandable surface **166**. The radiation source can include a liquid or a solid radiation source as described above. Shields **162** can be formed from radiopaque materials including those described above with respect to the radiopaque coating and can extend longitudinally from a base on the device located within the expandable surface **166**.

As shown in FIG. **8**, device **160** has two radiation shields **162** on opposed sides of catheter **168**. This configuration results in lower radiation dosing on the two sides of the device **160** on which the shields **162** are located as shown by isodose curve **170**. Device **180** (FIG. **9**) has a single radiation shield **162** resulting in an asymmetric isodose curve **182** as shown. A person or ordinary skill in the art will recognize that other configurations may be employed to achieve desired isodose curves.

The interstitial brachytherapy apparatus of the invention can be used in the treatment of a variety of malignant tumors, and is especially useful for in the treatment of brain and breast tumors.

Many breast cancer patients are candidates for breast conservation surgery, also known as lumpectomy, a procedure that is generally performed on early stage, smaller tumors. Breast conservation surgery is typically followed by postoperative radiation therapy Studies report that 80% of breast cancer recurrences after conservation surgery occur near the original tumor site, strongly suggesting that a tumor bed "boost" of local radiation to administer a strong direct dose may be effective in killing any remaining cancer and preventing recurrence at the original site. The apparatus described herein can be used for either the primary or boost therapy. Numerous studies and clinical trials have established equivalence of survival for appropriate patients treated with conservation surgery plus radiation therapy compared to mastectomy.

Surgery and radiation therapy are also the standard treatments for malignant solid brain tumors. The goal of surgery is to remove as much of the tumor as possible without damaging vital brain tissue. The ability to remove the entire malignant tumor is limited by its tendency to infiltrate adjacent normal tissue. Partial removal reduces the amount of tumor to be treated by radiation therapy and, under some circumstances, helps to relieve symptoms by reducing pressure on the brain.

A method according to the invention for treating these and other malignancies begins by surgical resection of a tumor site to remove at least a portion of the cancerous tumor and create a resection cavity. Following tumor resection, but prior to closing the surgical site, the surgeon intraoperatively places an interstitial brachytherapy catheter apparatus, having an inner spatial volume and an outer spatial volume as described above but without having the radioactive source material loaded, into the tumor resection cavity. Once the patient has sufficiently recovered from the surgery, the interstitial brachytherapy catheter is loaded with a radiation source. The radioactive source dwells in the catheter until the prescribed dose of radiotherapy is delivered, typically for approximately a week or less. The radiation source is then retrieved and the catheter is removed. The radiation treatment may end upon removal of the brachytherapy apparatus, or the brachytherapy may be supplemented by further doses of radiation supplied externally.

It will be understood that the foregoing is only illustrative of the principles of the invention, and that various modifications can be made by those skilled in the art without departing from the scope and spirit of the invention, including, but not limited to, combinations of elements from different embodiments found herein. All references cited herein are expressly incorporated by reference in their entirety.

What is claimed is:

1. An interstitial brachytherapy apparatus for treating target tissue surrounding a surgical extraction comprising:

an expandable outer surface defining a three-dimensional apparatus volume configured to fill an interstitial void created by the surgical extraction of diseased tissue and define an inner boundary of the target tissue being treated;

a radiation source disposed completely within the expandable outer surface and located so as to be spaced apart from the apparatus volume, the radiation source further being asymmetrically located and arranged within the expandable surface to provide predetermined asymmetric isodose curves with respect to the apparatus volume.

2. A surgical apparatus for providing radiation treatment to target tissue comprising:

an expandable outer surface defining an apparatus volume;

a radiation source replaceably disposable within the expandable outer surface, the radiation source comprising a plurality of solid radiation sources arranged to provide predetermined asymmetric isodose curves within the target tissue, the plurality of solid radiation sources being provided in a spaced apart relationship on a single elongate member, the single elongate member being shaped to provide asymmetric placement of the spaced apart solid radiation sources with respect to a longitudinal axis through the apparatus volume.

3. The apparatus of claim **2**, further comprising a catheter in communication with the apparatus volume, the elongate member extending through the catheter into the apparatus volume.

4. The apparatus of claim **3**, wherein the elongate member is formed of a shape memory alloy, the elongate member being shaped to provide asymmetric placement of the spaced apart solid radiation sources, taking on a substantially straight shape while being inserted through the catheter to the apparatus volume, and resuming an asymmetric shape when extended into the apparatus volume.

5. A surgical apparatus for providing radiation treatment to target tissue comprising:

an expandable outer surface defining an apparatus volume;

a radiation source replaceably disposable within the expandable outer surface, the radiation source comprising a plurality of solid radiation sources arranged to provide predetermined asymmetric isodose curves within the target tissue, wherein at least one of the plurality of solid radiation sources has a different specific activity from at least one other solid radiation source.

6. A surgical apparatus for providing radiation treatment to target tissue comprising:

an expandable outer surface defining an apparatus volume;

a radiation source replaceably disposable within the expandable outer surface, the radiation source comprising a plurality of solid radiation sources arranged to provide predetermined asymmetric isodose curves within the target tissue, the plurality of radiation sources being provided on at least two elongate members extending into the apparatus volume, at least one of the elongate members being shaped to provide asymmetric placement of a radiation source with respect to a longitudinal axis through the apparatus volume.

7. The apparatus of claim **6**, wherein each of the at least two elongate members includes a plurality of solid radiation sources provided in a spaced apart relationship.

8. The apparatus of claim **1**, wherein the expandable outer surface is sufficiently rigid to deform the target tissue into the shape of the expandable outer surface, causing the predetermined asymmetric isodose curves to penetrate into the target tissue to a prescribed depth.

9. An interstitial brachytherapy apparatus for treating target tissue surrounding a surgical extraction comprising:

an expandable outer surface having a base and defining a three-dimensional apparatus volume configured to fill an interstitial void created by the surgical extraction of diseased tissue and define an inner boundary of the target tissue being treated;

a radiation source disposed completely within and spaced apart from the expandable outer surface; and

an asymmetric radiation shield spaced apart from the radiation source, the asymmetric radiation shield providing predetermined asymmetric isodose curves with respect to the apparatus volume.

10. The apparatus of claim **9**, wherein the asymmetric radiation shield comprises a radio-opaque material disposed on only a portion of the expandable outer surface.

11. The apparatus of claim **10**, wherein the expandable outer surface comprises an inflatable balloon.

12. The apparatus of claim **11**, wherein the radiation shield comprises a barium material disposed a portion of the inflatable balloon.

13. The apparatus of claim **9**, further comprising at least one radiation shield extending from the base of the expandable outer surface toward an opposite end of the expandable surface, the shield being in between and spaced apart from the radiation source and the expandable outer surface, the shield forming a radio-opaque barrier between a portion of the radiation source and the target tissue.

14. The apparatus of claim **13**, wherein the radiation shield comprises two shields provided on opposite sides of the radiation source.

* * * * *

Exhibit 4

Henry C. Su (SBN 211202; suh@howrey.com)
Katharine L. Altemus (SBN 227080; altemusk@howrey.com)
HOWREY LLP
1950 University Avenue, 4th Floor
East Palo Alto, California 94303
Telephone: (650) 798-3500
Facsimile: (650) 798-3600

Robert Ruyak
Matthew Wolf (Admitted *Pro Hac Vice*)
Marc Cohn (Admitted *Pro Hac Vice*)
HOWREY LLP
1299 Pennsylvania Avenue, NW
Washington, DC 20004
Telephone: (202) 783-0800
Facsimile: (202) 383-6610

Attorneys for Plaintiffs
HOLOGIC, INC., CYTYC CORPORATION and HOLOGIC L.P.

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN JOSE DIVISION

HOLOGIC, INC., CYTYC CORPORATION, and HOLOGIC L.P.,

Plaintiffs,

vs.

SENORX, INC.,

Defendant.

AND RELATED COUNTERCLAIMS.

Case No. C08 00133 RMW (RS)

PLAINTIFFS' DISCLOSURE OF ASSERTED CLAIMS AND PRELIMINARY INFRINGEMENT CONTENTIONS UNDER PATENT LOCAL RULE 3-1

Plaintiffs Hologic, Inc, Cytyc Corporation, and Hologic L.P. (collectively, "Hologic"), by counsel and pursuant to Patent Local Rule 3-1 of this Court, hereby submits its disclosure of asserted claims and preliminary infringement contentions relating to U.S. Patents Nos. 5,913,813 (the '''813 patent"), 6,413,204 (the "'204 patent"), and 6,482,142 (the "'142 patent"). Hologic reserves the right to supplement or amend its identification of asserted claims, accused instrumentalities and infringement contentions contained herein (a) based on additional information concerning Defendant SenoRx, Inc.' s ("SenoRx") products and methods obtained through discovery or other means, (b) as appropriate, in response to the Court's determination of legal issues, including without limitation the construction of disputed terms, phrases and clauses identified by either party, or (c) for any other good cause shown. See Pat. L.R. 3-6 & 3-7.

I. INFRINGEMENT CHARTS FOR EACH ASSERTED CLAIM (Patent L.R. 3-1(c))

A. U.S. Patent No. 5,913,813

Attached as Appendix A is a chart identifying specifically where each element of each asserted claim of the '813 patent (claims 11 and 12) is found within SenoRx's Contura™ Multi-Lumen Balloon Source Applicator for Brachytherapy, models B001-45 and B011-45.

B. U.S. Patent No. 6,413,204

Attached as Appendix B is a chart identifying specifically where each element of each asserted claim of the '204 patent (claims 4 and 17) is found within SenoRx's Contura™ Multi-Lumen Balloon Source Applicator for Brachytherapy, models B001-45 and B011-45. Each asserted claim is entitled to a priority date of July 4, 1997.

C. U.S. Patent No. 6,482,142

Attached as Appendix C is a chart identifying specifically where each element of each asserted claim of the '142 patent (claims 1, 6, and 8) is found within SenoRx's Contura™ Multi-Lumen Balloon Source Applicator for Brachytherapy, models B001-45 and B011-45. The first two claim elements of claim 1 (as tabled in Appendix C) are entitled to a priority date of July 4, 1997.

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D. Materials Relied Upon

Attached as Appendix D is a list of exemplary materials that provide factual support for Hologic's infringement contentions, as set forth herein and in Appendices A, B, and C. While sufficient on their own to establish infringement, the materials appearing on this list are not intended to be the complete factual record on which Hologic will rely to prove infringement at trial.

II. RELIANCE ON OWN PRODUCTS AS PRACTICING THE CLAIMED INVENTION (Patent L.R. 3-1(f))

Hologic intends to rely upon its own products, namely, the Mammosite® Radiation Therapy System, as practicing the inventions of each and every asserted claim of the '813 and '204 patents.

Dated: May 6, 2008

HOWREY LLP

By: _____
Katharine L. Altemus

HOWREY LLP
Attorneys for Plaintiffs
Hologic, Inc., Cytyc Corporation,
and Hologic L.P.

PROOF OF SERVICE

I am employed in the County of San Mateo, State of California. I am over the age of 18 and not a party to the within action. My business address is 1950 University Avenue, 4th Floor, East Palo Alto, California 94303.

On May 6, 2008, I served on the interested parties in said action the within:

PLAINTIFFS' DISCLOSURE OF ASSERTED CLAIMS AND PRELIMINARY INFRINGEMENT CONTENTIONS UNDER PATENT LOCAL RULE 3-1 with APPENDIX A, APPENDIX B, APPENDIX C, and APPENDIX D

by placing a true copy thereof in a sealed envelope(s) addressed as stated below and causing such envelope(s) to be deposited in the U.S. Mail at East Palo Alto, California.

F.T. Alexandra Mahaney; amahaney@wsgr.com
Natalie J. Morgan; nmorgan@wsgr.com
Wilson Sonsini Goodrich & Rosati
12235 El Camino Real, Suite 200
San Diego, California 92130

Bruce R. Genderson; bgenderson@wc.com
Aaron P. Maurer; amaurer@wc.com
Rachael Shanahan Rodman; rrodman@wc.com
Adam D. Harber; aharber@wc.com
Williams & Connolly LLP
725 – 12th Street, N.W.
Washington, D.C. 20005

☒ (MAIL) I am readily familiar with this firm's practice of collection and processing correspondence for mailing. Under that practice it would be deposited with the U.S. postal service on that same day in the ordinary course of business. I am aware that on motion of party served, service is presumed invalid if postal cancellation date or postage meter date is more than 1 day after date of deposit for mailing in affidavit.

☒ (EMAIL/ELECTRONIC TRANSMISSION) Based on a court order or an agreement of the parties to accept service by e-mail or electronic transmission, I caused the documents to be sent to the persons at the e-mail addresses listed above. I did not receive, within a reasonable time after the submission, any electronic message or other indication that the transmission was unsuccessful.

I declare under penalty of perjury that I am employed in the office of a member of the bar of this Court at whose direction the service was made and that the foregoing is true and correct.

Executed on May 6, 2008, at East Palo Alto, California.

Sonya Schwab
(Type or print name)

Sonya Schwab
(Signature)

Appendix A

APPENDIX A
INFRINGED CLAIMS OF U.S. Patent No. 5,913,813

Asserted Claim[1]	Contura™ Multi-Lumen Balloon Source Applicator [2]
1. *Apparatus for delivering radioactive emissions to a body location with a uniform radiation profile, comprising:*	**CONTENTION:** The Contura™ Multi-Lumen Balloon Source Applicator ("Contura™") (formerly marketed under the product name SenoRad) is an interstitial brachytherapy apparatus designed to deliver intracavity radiation to the margins of the cavity remaining after surgical resection of breast cancer. SenoRx Inc. ("SenoRx") makes, uses, offers for sale, and sells an interstitial brachytherapy applicator marketed under the product name Contura™ Multi-Lumen Balloon Source Applicator for Brachytherapy. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404; **Ref. No. 25** at SRX-HOL00003386; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 30; Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref. No. 38; Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. SenoRx also induces and contributes to direct infringement by others of claim 1 by making, using, marketing, offering for sale, selling, supplying, and distributing the Contura™ to physicians and health care facilities for use in treating breast cancer patients. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17**; **Ref. No. 22; Ref. No. 26; Ref. No. 34** at SRX-

[1] Asserted Claims 11 and 12 depend from unasserted Claims 1, 2, and 8 (for which, therefore, the elements are matched to features of the accused instrumentality).

[2] The "Support" cited herein is exemplary, and although sufficient to support a claim of infringement, is not the complete factual record on which Hologic intends to rely to prove infringement at trial. To the extent that further discovery shows any element of an asserted claim is not present literally, Hologic will rely at least on the identified evidence to show that the element is present under the doctrine of equivalents.

Asserted Claim[1]	Contura™ Multi-Lumen Balloon Source Applicator [2]
	HOL00006734, 6780-3784; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 37** at SRX-HOL00004778; **Ref. No. 39** at SRX-HOL00001540; **Ref. No. 41** at SRX-HOL00001792-1794; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. SenoRx has made, used, marketed, offered for sale, sold, supplied, and distributed the Contura knowing that it is especially made or especially adapted for infringing use. **Ref. No. 23** at SRX-HOL5408-5429; **Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55. The Contura is not a staple article or commodity of commerce suitable for substantial non-infringing use. **SUPPORT:** "The SenoRad Multi-Lumen Balloon Source Applicator for Brachytherapy is intended to provide brachytherapy when the physician chooses to deliver intracavitary radiation to the surgical margins following lumpectomy for breast cancer." **Ref. No. 1** at Device description. "The Contura™ MLB Applicator is intended to provide brachytherapy when the physician chooses to deliver intracavitary radiation to the surgical margins following lumpectomy for breast cancer." **Ref. No. 2 at 2232.** "SenoRx, Inc. (NASDAQ:SENO) today announced that it has launched Contura™, its Multi-Lumen Balloon (MLB) Catheter for delivering brachytherapy to the surgical margins following lumpectomy for breast cancer." **Ref. No. 5**. *See also* evidence attached to Plaintiffs' Motion For Preliminary Injunction, Plaintiffs' Reply Brief In Support of Motion For Preliminary Injunction, and evidence cited in Judge Whyte's Order Denying Plaintiffs' Motion For Preliminary Injunction. *See also* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404, 5408-5429; **Ref. No. 22; Ref. No. 25** at SRX-HOL00003386; **Ref. No. 26; Ref. No. 34** at SRX-HOL00006734, 6780-3784; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 30; Ref. No. 31**

Asserted Claim[1]	Contura™ Multi-Lumen Balloon Source Applicator [2]
	at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref. No. 38; Ref. No. 39** at SRX-HOL00001540; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788, 1792-1794; **Ref. No. 42** at SRX-HOL00002016-2019, 2030.
(a) a catheter body member having a proximal end and distal end;	**CONTENTION:** The Contura™ has a catheter with a proximal and distal end, with proximal ports for inflation and vacuum, as well as a distal "vacuum port." "Radiation source lumens" also run from the proximal end of the applicator into the treatment lumens at the distal end of the catheter. This claim element is thus literally infringed. **SUPPORT:** "The SenoRad applicator consists of a multi-lumen catheter connected to an inflatable spherical balloon that can be attached to commercially available High Dose Rate remote afterloader equipment for passage of the radiation source delivery wire." **Ref. No. 1** at Device description. "The Contura™ MLB Applicator consists of a multi-lumen catheter attached to an inflatable spherical balloon (Figure 1)." **Ref. No. 2 at 2232.** Illustrations of the SenoRx Multi-Lumen Balloon Source Applicator show a catheter with a proximal and distal end, with proximal ports for inflation ("inflation luer") and vacuum ("vacuum luer"), as well as a distal "vacuum port". "Radiation source lumens" are also run from the proximal end of the applicator into the treatment lumens at the distal end of the catheter. **Ref. No. 2** at Figure 1; **Ref. No. 3**. "Two proximal ports are also provided with Luer-type connectors for balloon inflation/deflation and for application of intracavitary vacuum." **Ref. No. 2 at 2232.** See generally **Ref. No. 4**. *See also* evidence attached to Plaintiffs' Motion For Preliminary Injunction, Plaintiffs'

Asserted Claim[1]	Contura™ Multi-Lumen Balloon Source Applicator [2]
	Reply Brief In Support of Motion For Preliminary Injunction, and evidence cited in Judge Whyte's Order Denying Plaintiffs' Motion For Preliminary Injunction.
(b) an inner spatial volume disposed proximate the distal end of the catheter body member;	**CONTENTION:** Each of the five treatment lumens inside the Contura™ balloon comprises a region of space surrounded by an outer spatial volume and enclosed by a polymeric film wall and therefore embodies an inner spatial volume proximate to the distal end of the Contura™ catheter. **Ref. No. 24** at 28. Alternatively, the radionuclide itself comprises a region of space surrounded by an outer spatial volume and defined by the outside surface of a solid radionuclide sphere and therefore embodies an inner spatial volume. ***Id***. This claim element is thus literally infringed. Alternatively, the five treatment lumens and the area within the balloon between and surrounding those lumens are insubstantially different from a region of space surrounded by an outer spatial volume and either enclosed by a polymeric film wall or defined by the outside surface of a solid radionuclide sphere. They function in substantially the same way (controlled positioning of a radiation source within the outer spatial volume) to provide substantially the same result (delivery of a prescribed radiation dose to target tissue). This claim element is thus infringed under the doctrine of equivalents. **SUPPORT:** **Ref. No. 24** at 28. "Five radiation source wire lumens are provided; one central lumen located along the long axis of the applicator and four curved lumens symmetrically offset from the central lumen." **Ref. No. 1** at Device description. "Five radiation source wire lumens are provided; one central lumen located along the long axis of the applicator and four curved lumens symmetrically offset from the central lumen." **Ref. No. 2** at page 2. An illustration of the Contura™ applicator shows the five treatment lumens within **Ref. No. 3.**

Asserted Claim[1]	Contura™ Multi-Lumen Balloon Source Applicator [2]
	See generally **Ref. No. 4** (showing 4 "offset" lumen). *See also* evidence attached to Plaintiffs' Motion For Preliminary Injunction, Plaintiffs' Reply Brief In Support of Motion For Preliminary Injunction, and evidence cited in Judge Whyte's Order Denying Plaintiffs' Motion For Preliminary Injunction.
(c) an outer, closed, inflatable, chamber defined by a radiation transparent wall affixed to the body member proximate the distal end thereof in surrounding relation to the inner spatial volume with a predetermined constant spacing between said inner spatial volume and the radiation transparent wall;	**CONTENTION:** The central treatment lumen is located within the balloon (i.e., the "outer, closed, inflatable chamber defined by a radiation transparent wall:") along the longitudinal axis of the applicator. The Contura™ inflatable balloon is an "outer, closed, inflatable, chamber"), and is affixed proximate to the vacuum port at the distal end of the applicator catheter. The surface of the expandable balloon ("a radiation transparent wall') defines the outer spatial volume of the balloon applicator. The Contura™ balloon surrounds and contains the inner spatial volume(s) discussed above. The spacing (predetermined by one of skill in the art) between the inner spatial volume and the wall of the Contura™ balloon is constant. This claim element is thus literally infringed. **SUPPORT:** "The SenoRad applicator consists of a multi-lumen catheter connected to an inflatable spherical balloon that can be attached to commercially available High Dose Rate remote afterloader equipment for passage of the radiation source delivery wire." **Ref. No. 1** at Device description. "Five radiation source wire lumens are provided; one central lumen located along the long axis of the applicator and four curved lumens symmetrically offset from the central lumen." **Ref. No. 1** at Device description. "The Contura™ MLB Applicator consists of a multi-lumen catheter attached to an inflatable spherical balloon (Figure 1)." **Ref. No. 2 at 2232.** "Five radiation source wire lumens are provided; one central lumen located along the long axis of the applicator and four curved lumens symmetrically offset from

Asserted Claim[1]	Contura™ Multi-Lumen Balloon Source Applicator [2]
	the central lumen." **Ref. No. 2** at page 2. An illustration of the Contura™ applicator shows the five treatment lumens within **Ref. No. 3.** See generally **Ref. No. 4**. *See also* evidence attached to Plaintiffs' Motion For Preliminary Injunction, Plaintiffs' Reply Brief In Support of Motion For Preliminary Injunction, and evidence cited in Judge Whyte's Order Denying Plaintiffs' Motion For Preliminary Injunction.
(d) a material containing a radionuclide(s) disposed in one of the inner spatial volume and outer chamber; and	**CONTENTION:** Each radiation source ("radiation source wire") is inserted through a radiation source lumen in the Contura into its respective central or curved treatment lumen. The five treatment lumens are located within the expandable outer surface of the balloon. Alternatively, each radiation source has a radionuclide surface that defines the inner spatial volume in which it is disposed. This claim element is thus literally infringed. SenoRx also induces and contributes to direct infringement by others of claim 1 by making, using, marketing, offering for sale, selling, supplying, and distributing the Contura™ to physicians and health care facilities for use in treating breast cancer patients. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17**; **Ref. No. 22; Ref. No. 26; Ref. No. 34** at SRX-HOL00006734, 6780-3784; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 37** at SRX-HOL00004778; **Ref. No. 39** at SRX-HOL00001540; **Ref. No. 41** at SRX-HOL00001792-1794; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. SenoRx has made, used, marketed, offered for sale, sold, supplied, and distributed the Contura knowing that it is especially made or especially adapted for infringing use. **Ref. No. 23** at SRX-HOL5408-5429; **Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55-55. The Contura is not a staple article or commodity of commerce suitable for substantial non-infringing use.

Asserted Claim[1]	Contura™ Multi-Lumen Balloon Source Applicator [2]
	SUPPORT: "The SenoRad applicator consists of a multi-lumen catheter connected to an inflatable spherical balloon that can be attached to commercially available High Dose Rate remote afterloader equipment for passage of the radiation source delivery wire." **Ref. No. 1** at Device description. "The Contura™ MLB applicator consists of a multi-lumen catheter connected to an inflatable spherical balloon that can be attached to commercially available HDR (High Dose Rate) remote afterloader equipment for passage of the radiation source delivery wire. Five radiation source wire lumens are provided, one central lumen located along the long axis of the applicator and four curved lumens symmetrically offset from the central lumen." **Ref. No. 19** at SRX-HOL00005564. See generally **Ref. No. 4**. *See also* evidence attached to Plaintiffs' Motion For Preliminary Injunction, Plaintiffs' Reply Brief In Support of Motion For Preliminary Injunction, and evidence cited in Judge Whyte's Order Denying Plaintiffs' Motion For Preliminary Injunction. *See also* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404, 5408-5429; **Ref. No. 22; Ref. No. 25** at SRX-HOL00003386; **Ref. No. 26; Ref. No. 34** at SRX-HOL00006734, 6780-3784; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 30; Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref. No. 38; Ref. No. 39** at SRX-HOL00001540; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788, 1792-1794; **Ref. No. 42** at SRX-HOL00002016-2019, 2030.
(e) means disposed in the other of the inner spatial volume and outer chamber for rendering uniform the radial absorbed dose profile of the emissions from the	**CONTENTION:** The Contura™ balloon is intended to be filled with a radiation absorbing or attenuating

Asserted Claim[1]	Contura™ Multi-Lumen Balloon Source Applicator [2]
one of the inner spatial volume and outer chamber containing the radionuclides.	material (e.g., physiological saline or saline/contrast mixture) for making the absorbed dose of radiation more uniform to prevent over-treatment of body tissue at or close to the outer wall of the balloon ("rendering uniform the radial absorbed dose profile of the emissions from the radiation source within the inner spatial volume"). This claim element is thus literally infringed. **SUPPORT:** "The balloon is inflated to a 4 or 5 cm spherical shape by a controlled volume injunction of physiological saline to approximately 33 or 58 ml. respectively." **Ref. No. 19** at SRX-HOL00005564. "The inflated shape allows for placement of a radiation source at the center or close to the center of the balloon to deliver doses of gamma radiation to the margins of the lumpectomy cavity." **Ref. No. 19** at SRX-HOL00005564 "Inflate balloon with saline/contrast mixture" **Ref. No. 17** at SRX-HOL00006650. "The balloon is then inflated to a 4 to 6 cm spherical shape by a controlled volume injection of physiological saline." **Ref. No. 20** at SRX-HOL00004120. "Contrast media concentration of less than 10% are recommended to prevent dose attenuation." **Ref. No. 2** at 2232. "8. Using the syringes provided, inflate the Applicator balloon with the contrast media solution to the desired fill volume. Purge any air from the fill syringes before attaching them to the Applicator." Desired balloon diameter — Approximate balloon fill volume 4 cm — 33 ml 5 cm — 58 ml **Ref. No. 2** at 2232. *See also* **Ref. No. 16** at SRX-HOL00006598. See generally **Ref. No. 4**.

Asserted Claim[1]	Contura™ Multi-Lumen Balloon Source Applicator [2]
	See also evidence attached to Plaintiffs' Motion For Preliminary Injunction, Plaintiffs' Reply Brief In Support of Motion For Preliminary Injunction, and evidence cited in Judge Whyte's Order Denying Plaintiffs' Motion For Preliminary Injunction.
2. *The apparatus as in claim 1 wherein said inner spatial volume is an inner closed, chamber defined by a further radiation transparent wall.*	**CONTENTION:** Each of the five treatment lumens inside the Contura™ balloon comprises a region of space, which is an inner, closed chamber, surrounded by an outer spatial volume and enclosed by a radiation transparent, polymeric film wall. Each of the five treatment lumens thus embodies an inner spatial volume proximate to the distal end of the Contura™ catheter. **Ref. No. 24** at 28. This claim element is thus literally infringed. Alternatively, the five treatment lumens and the area within the balloon between and surrounding those lumens are insubstantially different from a region of space that is an inner, closed chamber, surrounded by an outer spatial volume and enclosed by a radiation transparent, polymeric film wall. This claim element is thus infringed under the doctrine of equivalents. SenoRx Inc. ("SenoRx") makes, uses, offers for sale, and sells an interstitial brachytherapy applicator marketed under the product name Contura™ Multi-Lumen Balloon Source Applicator for Brachytherapy. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404; **Ref. No. 25** at SRX-HOL00003386; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 30; Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref. No. 38; Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. SenoRx also induces and contributes to direct infringement by others of claim 2 by making, using, marketing, offering for sale, selling, supplying, and distributing the Contura™ to physicians and health care facilities for use in treating breast cancer patients. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17**; **Ref. No. 22; Ref. No. 26; Ref. No. 34** at SRX-

Asserted Claim[1]	Contura™ Multi-Lumen Balloon Source Applicator [2]
	HOL00006734, 6780-3784; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 37** at SRX-HOL00004778; **Ref. No. 39** at SRX-HOL00001540; **Ref. No. 41** at SRX-HOL00001792-1794; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. SenoRx has made, used, marketed, offered for sale, sold, supplied, and distributed the Contura knowing that it is especially made or especially adapted for infringing use. **Ref. No. 23** at SRX-HOL5408-5429; **Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55. The Contura is not a staple article or commodity of commerce suitable for substantial non-infringing use. **SUPPORT:** See **Ref. No. 21**. See generally **Ref. No. 4**. *See also* evidence attached to Plaintiffs' Motion For Preliminary Injunction, Plaintiffs' Reply Brief In Support of Motion For Preliminary Injunction, and evidence cited in Judge Whyte's Order Denying Plaintiffs' Motion For Preliminary Injunction. *See also* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404, 5408-5429; **Ref. No. 22; Ref. No. 25** at SRX-HOL00003386; **Ref. No. 26; Ref. No. 34** at SRX-HOL00006734, 6780-3784; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 30; Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55-55; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref. No. 38; Ref. No. 39** at SRX-HOL00001540; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788, 1792-1794; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. *See also* **Ref. No. 24** at 28.

Asserted Claim[1]	Contura™ Multi-Lumen Balloon Source Applicator [2]
***8**. The apparatus as in claim 2 wherein the inner chamber contains the radioactive material.*	**CONTENTION:** Each of the five treatment lumens inside the Contura™ balloon provides an inner, closed chamber, which during use, is the structure that contains a radioactive source. **Ref. No. 24** at 28. This claim element is thus literally infringed. SenoRx Inc. ("SenoRx") makes, uses, offers for sale, and sells an interstitial brachytherapy applicator marketed under the product name Contura™ Multi-Lumen Balloon Source Applicator for Brachytherapy. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404; **Ref. No. 25** at SRX-HOL00003386; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 30; Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref. No. 38; Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. SenoRx also induces and contributes to direct infringement by others of claim 8 by making, using, marketing, offering for sale, selling, supplying, and distributing the Contura™ to physicians and health care facilities for use in treating breast cancer patients. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17**; **Ref. No. 22; Ref. No. 26; Ref. No. 34** at SRX-HOL00006734, 6780-3784; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 37** at SRX-HOL00004778; **Ref. No. 39** at SRX-HOL00001540; **Ref. No. 41** at SRX-HOL00001792-1794; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. SenoRx has made, used, marketed, offered for sale, sold, supplied, and distributed the Contura knowing that it is especially made or especially adapted for infringing use. **Ref. No. 23** at SRX-HOL5408-5429; **Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55. The Contura is not a staple article or commodity of commerce

Asserted Claim[1]	Contura™ Multi-Lumen Balloon Source Applicator [2]
	suitable for substantial non-infringing use. **SUPPORT:** "The Contura™ MLB applicator consists of a multi-lumen catheter connected to an inflatable spherical balloon that can be attached to commercially available HDR (High Dose Rate) remote afterloader equipment for passage of the radiation source delivery wire. Five radiation source wire lumens are provided, one central lumen located along the long axis of the applicator and four curved lumens symmetrically offset from the central lumen." **Ref. No. 19** at SRX-HOL00005564. See generally **Ref. No. 4**. *See also* evidence attached to Plaintiffs' Motion For Preliminary Injunction, Plaintiffs' Reply Brief In Support of Motion For Preliminary Injunction, and evidence cited in Judge Whyte's Order Denying Plaintiffs' Motion For Preliminary Injunction. *See also* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404, 5408-5429. *See also* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404, 5408-5429; **Ref. No. 22; Ref. No. 25** at SRX-HOL00003386; **Ref. No. 26; Ref. No. 34** at SRX-HOL00006734, 6780-3784; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 30; Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref. No. 38; Ref. No. 39** at SRX-HOL00001540; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788, 1792-1794; **Ref. No. 42** at SRX-HOL00002016-2019, 2030.

Asserted Claim[1]	Contura™ Multi-Lumen Balloon Source Applicator [2]
	See also **Ref. No. 24** at 28.
11. The apparatus as in claim 8 wherein the radioactive material is a solid.	**CONTENTION:** During patient treatment, an afterloader under computer control inserts source wires with attached solid radionuclides through the radiation source wire lumens of the Contura™ device into predetermined source dwell positions within the treatment lumens ("inner chamber") at the distal end of the device. This claim element is thus literally infringed. SenoRx Inc. ("SenoRx") makes, uses, offers for sale, and sells an interstitial brachytherapy applicator marketed under the product name Contura™ Multi-Lumen Balloon Source Applicator for Brachytherapy. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404; **Ref. No. 25** at SRX-HOL00003386; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 30; Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref. No. 38; Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. SenoRx also induces and contributes to direct infringement by others of claim 11 by making, using, marketing, offering for sale, selling, supplying, and distributing the Contura™ to physicians and health care facilities for use in treating breast cancer patients. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17**; **Ref. No. 22; Ref. No. 26; Ref. No. 34** at SRX-HOL00006734, 6780-3784; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 37** at SRX-HOL00004778; **Ref. No. 39** at SRX-HOL00001540; **Ref. No. 41** at SRX-HOL00001792-1794; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. SenoRx has made, used, marketed, offered for sale, sold, supplied, and distributed the

Asserted Claim[1]	Contura™ Multi-Lumen Balloon Source Applicator [2]
	Contura knowing that it is especially made or especially adapted for infringing use. **Ref. No. 23** at SRX-HOL5408-5429; **Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55. The Contura is not a staple article or commodity of commerce suitable for substantial non-infringing use. **SUPPORT:** "The SenoRad Multi-Lumen Balloon Source Applicator for Brachytherapy is intended to provide brachytherapy when the physician chooses to deliver intracavitary radiation to the surgical margins following lumpectomy for breast cancer." **Ref. No. 1** at Device description. "Lumens are provided for attachment to commercially available HDR (High Dose Rate) remote afterloader equipment for passage of the radiation source delivery wire." **Ref. No. 2** at 2232. "Afterloader compatibility: Model B001-45-VeriSource 200, VariSource ID and Nucletron HDR afterloaders. Model B011-45-GammaMedPlus afterloader (Cannot be used with GammaMed 12f)." **Ref. No. 2** at 2232. "SenoRx, Inc. (NASDAQ:SENO) today announced that it has launched Contura™, its Multi-Lumen Balloon (MLB) Catheter for delivering brachytherapy to the surgical margins following lumpectomy for breast cancer." **Ref. No. 5**. See generally **Ref. No. 4**. *See also* evidence attached to Plaintiffs' Motion For Preliminary Injunction, Plaintiffs' Reply Brief In Support of Motion For Preliminary Injunction, and evidence cited in Judge Whyte's Order Denying Plaintiffs' Motion For Preliminary Injunction. *See also* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404, 5408-5429; **Ref. No. 22; Ref. No. 25** at SRX-HOL00003386; **Ref. No. 26; Ref. No. 34** at SRX-HOL00006734, 6780-3784; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 30; Ref. No. 31**

Asserted Claim[1]	Contura™ Multi-Lumen Balloon Source Applicator [2]
	at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref. No. 38; Ref. No. 39** at SRX-HOL00001540; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788, 1792-1794; **Ref. No. 42** at SRX-HOL00002016-2019, 2030.
12. The apparatus as in claim 1 wherein the material containing a radionuclide comprises a plurality of radioactive solid particles placed at predetermined locations within the inner spatial volume to provide a desired composite radiation profile.	**CONTENTION:** During treatment using the Contura, the radiation source wire lumens to which the radionuclide(s) is/are attached are inserted into predetermined locations (dwell positions) within the treatment lumens at the distal end of the device. The multiple treatment lumens of the Contura™ allow multiple solid radiation sources (e.g., single radionuclide sources on multiple separate source wires) to be arrayed simultaneously within separate lumens to provide a desired composite radiation profile within the targeted tissue. Alternatively, a single solid radionuclide on a source wire can be inserted sequentially into one or more predetermined locations within multiple treatment lumens to provide a desired composite radiation profile within the targeted tissue. This claim element is thus literally infringed. SenoRx Inc. ("SenoRx") makes, uses, offers for sale, and sells an interstitial brachytherapy applicator marketed under the product name Contura™ Multi-Lumen Balloon Source Applicator for Brachytherapy. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404; **Ref. No. 25** at SRX-HOL00003386; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 30; Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref. No. 38; Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. SenoRx also induces and contributes to direct infringement by others of claim 12 by making, using, marketing, offering for sale, selling, supplying, and distributing the Contura™ to physicians and health care facilities for use in treating breast cancer patients. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at

Asserted Claim[1]	Contura™ Multi-Lumen Balloon Source Applicator [2]
	SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17**; **Ref. No. 22; Ref. No. 26; Ref. No. 34** at SRX-HOL00006734, 6780-3784; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 37** at SRX-HOL00004778; **Ref. No. 39** at SRX-HOL00001540; **Ref. No. 41** at SRX-HOL00001792-1794; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. SenoRx has made, used, marketed, offered for sale, sold, supplied, and distributed the Contura knowing that it is especially made or especially adapted for infringing use. **Ref. No. 23** at SRX-HOL5408-5429; **Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55. The Contura is not a staple article or commodity of commerce suitable for substantial non-infringing use. **SUPPORT:** "The radiation balloon uses vacuum to remove excess air and fluid and to adhere closely to often irregularly shaped lumpectomy cavities in order to deliver precise radiation dosing through multiple seed lumens." **Ref. No. 17** at SRX-HOL00006639. "Each lumen can accommodate 8 dwell positions." **Ref. No. 17** at SRX-HOL00006642. *See also* evidence attached to Plaintiffs' Motion For Preliminary Injunction, Plaintiffs' Reply Brief In Support of Motion For Preliminary Injunction, and evidence cited in Judge Whyte's Order Denying Plaintiffs' Motion For Preliminary Injunction. *See also* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404, 5408-5429; **Ref. No. 22; Ref. No. 25** at SRX-HOL00003386; **Ref. No. 26; Ref. No. 34** at SRX-HOL00006734, 6780-3784; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 30; Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref. No. 38; Ref. No. 39** at SRX-HOL00001540; **Ref. No. 40** at SRX-HOL00001675-1688,

Asserted Claim[1]	Contura™ Multi-Lumen Balloon Source Applicator [2]
	1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788, 1792-1794; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. *See also* **Ref. No. 21**.

Appendix B

APPENDIX B
INFRINGED CLAIMS OF U.S. Patent No. 6,413,204

Asserted Claim[1,2]	Contura™ Multi-Lumen Balloon Source Applicator[3]
***1**. An interstitial brachytherapy apparatus for delivering radioactive emissions to an internal body location comprising:*	**CONTENTION:** The Contura Multi-Lumen Balloon Source Applicator ("Contura™") is an interstitial brachytherapy apparatus designed to deliver intracavity radiation to the margins of the cavity remaining after surgical resection of breast cancer. SenoRx Inc. ("SenoRx") makes, uses, offers for sale, and sells an interstitial brachytherapy applicator marketed under the product name Contura™ Multi-Lumen Balloon Source Applicator for Brachytherapy. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404; **Ref. No. 25** at SRX-HOL00003386; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 30; Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref. No. 38; Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. SenoRx also induces and contributes to direct infringement by others of claim 1 by making, using, marketing, offering for sale, selling, supplying, and distributing the Contura™ to physicians and health care facilities for use in treating breast cancer patients. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at

[1] Each asserted claim is entitled to a priority date of July 24, 1997.

[2] Asserted Claims 4 and 17 depend from unasserted claims 1, 2, and 3 (for which, therefore, the elements are matched to features of the accused instrumentality).

[3] The "Support" cited herein is exemplary, and although sufficient to support a claim of infringement, is not the complete factual record on which Hologic intends to rely to prove infringement at trial. To the extent that further discovery shows any element of an asserted claim is not present literally, Hologic will rely on at least the identified evidence to show that the element is present under the doctrine of equivalents.

Asserted Claim[1,2]	Contura™ Multi-Lumen Balloon Source Applicator[3]
	SRX-HOL00006591-6601; **Ref. No. 17**; **Ref. No. 22; Ref. No. 26; Ref. No. 34** at SRX-HOL00006734, 6780-3784; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 37** at SRX-HOL00004778; **Ref. No. 39** at SRX-HOL00001540; **Ref. No. 41** at SRX-HOL00001792-1794; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. SenoRx has made, used, marketed, offered for sale, sold, supplied, and distributed the Contura knowing that it is especially made or especially adapted for infringing use. **Ref. No. 23** at SRX-HOL5408-5429; **Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55. The Contura is not a staple article or commodity of commerce suitable for substantial non-infringing use. **SUPPORT:** "The SenoRad Multi-Lumen Balloon Source Applicator for Brachytherapy is intended to provide brachytherapy when the physician chooses to deliver intracavitary radiation to the surgical margins following lumpectomy for breast cancer." **Ref. No. 1** at Device description. "The Contura™ MLB Applicator is intended to provide brachytherapy when the physician chooses to deliver intracavitary radiation to the surgical margins following lumpectomy for breast cancer." **Ref. No. 2 at 2232.** "SenoRx, Inc. (NASDAQ:SENO) today announced that it has launched Contura™, its Multi-Lumen Balloon (MLB) Catheter for delivering brachytherapy to the surgical margins following lumpectomy for breast cancer." **Ref. No. 5**. *See also* evidence attached to Plaintiffs' Motion For Preliminary Injunction, Plaintiffs' Reply Brief In Support of Motion For Preliminary Injunction, and evidence cited in Judge Whyte's Order Denying Plaintiffs' Motion For Preliminary Injunction. *See also* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404, 5408-5429; **Ref. No. 22; Ref. No. 25** at SRX-HOL00003386; **Ref. No. 26; Ref. No. 34** at

Asserted Claim[1,2]	Contura™ Multi-Lumen Balloon Source Applicator[3]
	SRX-HOL00006734, 6780-3784; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 30; Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref. No. 38; Ref. No. 39** at SRX-HOL00001540; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788, 1792-1794; **Ref. No. 42** at SRX-HOL00002016-2019, 2030.
(a) a catheter body member having a proximal end and distal end;	**CONTENTION:** The Contura™ has a catheter with a proximal and distal end, with proximal ports for inflation and vacuum, as well as a distal "vacuum port." "Radiation source lumens" also run from the proximal end of the applicator into the treatment lumens at the distal end of the catheter. This claim element is thus literally infringed. **SUPPORT:** "The SenoRad applicator consists of a multi-lumen catheter connected to an inflatable spherical balloon that can be attached to commercially available High Dose Rate remote afterloader equipment for passage of the radiation source delivery wire." **Ref. No. 1** at Device description. "The Contura™ MLB Applicator consists of a multi-lumen catheter attached to an inflatable spherical balloon (Figure 1)." **Ref. No. 2 at 2232.** Illustrations of the SenoRx Multi-Lumen Balloon Source Applicator show a catheter with a proximal and distal end, with proximal ports for inflation ("inflation luer") and vacuum ("vacuum luer"), as well as a distal "vacuum port". "Radiation source lumens" are also run from the proximal end of the applicator into the treatment lumens at the distal end of the catheter. **Ref. No. 2** at Figure 1; **Ref. No. 3**. "Two proximal ports are also provided with Luer-type connectors for balloon inflation/deflation and for application of intracavitary vacuum." **Ref. No. 2 at 2232.** See generally **Ref. No. 4**.

Asserted Claim[1,2]	Contura™ Multi-Lumen Balloon Source Applicator[3]
	See also evidence attached to Plaintiffs' Motion For Preliminary Injunction, Plaintiffs' Reply Brief In Support of Motion For Preliminary Injunction, and evidence cited in Judge Whyte's Order Denying Plaintiffs' Motion For Preliminary Injunction.
(b) an inner spatial volume disposed proximate to the distal end of the catheter body member;	**CONTENTION:** Each of the five treatment lumens inside the Contura™ balloon comprises a region of space surrounded by an outer spatial volume and enclosed by a polymeric film wall and therefore embodies an inner spatial volume proximate to the distal end of the Contura™ catheter. **Ref. No. 24** at 28. Alternatively, the radionuclide itself comprises a region of space surrounded by an outer spatial volume and defined by the outside surface of a solid radionuclide sphere and therefore embodies an inner spatial volume. ***Id.*** This claim element is thus literally infringed. Alternatively, the five treatment lumens and the area within the balloon between and surrounding those lumens are insubstantially different from a region of space surrounded by an outer spatial volume and either enclosed by a polymeric film wall or defined by the outside surface of a solid radionuclide sphere. They function in substantially the same way (controlled positioning of a radiation source within the outer spatial volume) to provide substantially the same result (delivery of a prescribed radiation dose to target tissue). This claim element is thus infringed under the doctrine of equivalents. **SUPPORT:** "Five radiation source wire lumens are provided; one central lumen located along the long axis of the applicator and four curved lumens symmetrically offset from the central lumen." **Ref. No. 1** at Device description. "Five radiation source wire lumens are provided; one central lumen located along the long axis of the Applicator and four curved lumens symmetrically offset from the central lumen." **Ref. No. 2** at page 2232. An illustration of the Contura™ applicator shows the five treatment lumens within **Ref. No. 3.**

Asserted Claim[1,2]	Contura™ Multi-Lumen Balloon Source Applicator[3]
	See generally **Ref. No. 4** (showing 4 "offset" lumen). *See also* evidence attached to Plaintiffs' Motion For Preliminary Injunction, Plaintiffs' Reply Brief In Support of Motion For Preliminary Injunction, and evidence cited in Judge Whyte's Order Denying Plaintiffs' Motion For Preliminary Injunction. *See also* **Ref. No. 24** at 28.
(c) an outer spatial volume defined by an expandable surface element disposed proximate to the distal end of the body member in a surrounding relation to the inner spatial volume; and	**CONTENTION:** The inflatable spherical balloon is an "expandable surface element", and is located proximate to the vacuum port at the distal end of the applicator catheter. The three-dimensional surface of the expandable balloon defines the outer spatial volume of the balloon applicator. The outer spatial volume surrounds and contains the inner spatial volume(s). Each of the five treatment lumens inside the Contura™ balloon comprises a region of space surrounded by an outer spatial volume and enclosed by a polymeric film wall and therefore embodies an inner spatial volume proximate to the distal end of the Contura™ catheter. **Ref. No. 24** at 28. Alternatively, the radionuclide itself comprises a region of space surrounded by an outer spatial volume and defined by the outside surface of a solid radionuclide sphere and therefore embodies an inner spatial volume. ***Id.*** This claim element is thus literally infringed. Alternatively, the five treatment lumens and the area within the balloon between and surrounding those lumens are insubstantially different from a region of space surrounded by an outer spatial volume and either enclosed by a polymeric film wall or defined by the outside surface of a solid radionuclide sphere. They function in substantially the same way (controlled positioning of a radiation source within the outer spatial volume) to provide substantially the same result (delivery of a prescribed radiation dose to target tissue). This claim element is thus infringed under the doctrine of equivalents. **SUPPORT:** "The SenoRad applicator consists of a multi-lumen catheter connected to an inflatable spherical balloon that can be attached to commercially available High Dose Rate remote afterloader equipment for passage of the radiation source delivery wire. Five radiation source wire lumens are provided; one central lumen

Asserted Claim[1,2]	Contura™ Multi-Lumen Balloon Source Applicator[3]
	located along the long axis of the applicator and four curved lumens symmetrically offset from the central lumen. The balloon is inflated to a 4 or 5 cm spherical shape by a controlled volume injection of physiological saline to approximately 32 or 55 ml, respectively." **Ref. No. 1** at Device description. "The Contura™ MLB Applicator consists of a multi-lumen catheter attached to an inflatable spherical balloon (figure 1). Lumens are provided for attachment to commercially available HDR (High Dose Rate) remote afterloader equipment for passage of the radiation source delivery wire. Five radiation source wire lumens are provided; one central lumen located along the long axis of the applicator and four curved lumens symmetrically offset from the central lumen." **Ref. No. 2** at page 2232. An illustration of the Contura™ applicator shows the five treatment lumens, the outer spatial volume as defined by the expandable polyurethane balloon, and the inner spatial volume. **Ref. No. 3.** See generally **Ref. No. 4** (showing expansion of balloon with subsequent increase in size of outer spatial volume) *See also* evidence attached to Plaintiffs' Motion For Preliminary Injunction, Plaintiffs' Reply Brief In Support of Motion For Preliminary Injunction, and evidence cited in Judge Whyte's Order Denying Plaintiffs' Motion For Preliminary Injunction. *See also* **Ref. No. 24** at 28.
(d) a radiation source disposed in the inner spatial volume and generating a three-dimensional isodose profile that is substantially similar in shape to the expandable surface element.	**CONTENTION:** Each radiation source ("radiation source wire") is inserted through a radiation source lumen into its respective central or curved treatment lumen (one "central lumen" and four "curved lumens"). Each of the five treatment lumens inside the Contura™ balloon comprises a region of space surrounded by an outer spatial volume and enclosed by a polymeric film wall and therefore embodies an inner spatial volume proximate to the distal end of the Contura™ catheter. **Ref. No. 24** at 28. Alternatively, the radionuclide itself comprises a region of space surrounded by an outer spatial volume and defined by the outside surface of a solid radionuclide sphere and therefore embodies an inner spatial volume. ***Id.*** The Contura™ balloon surrounds and contains the inner spatial

Asserted Claim[1,2]	Contura™ Multi-Lumen Balloon Source Applicator[3]
	volume(s). Because the spacing (predetermined by one of skill in the art) between the inner spatial volume and the wall of the spherical Contura™ balloon is constant, the accused device provides a three-dimensional isodose profile generated by the radiation source that is substantially similar in shape to the balloon. This claim element is thus literally infringed. Alternatively, the five treatment lumens and the area within the balloon between and surrounding those lumens are insubstantially different from a region of space surrounded by an outer spatial volume and either enclosed by a polymeric film wall or defined by the outside surface of a solid radionuclide sphere. They function in substantially the same way (controlled positioning of a radiation source within the outer spatial volume) to provide substantially the same result (delivery of a prescribed radiation dose to target tissue). This claim element is thus infringed under the doctrine of equivalents. SenoRx also induces and contributes to direct infringement by others of claim 1 by making, using, marketing, offering for sale, selling, supplying, and distributing the Contura™ to physicians and health care facilities for use in treating breast cancer patients. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17**; **Ref. No. 22; Ref. No. 26; Ref. No. 34** at SRX-HOL00006734, 6780-3784; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 37** at SRX-HOL00004778; **Ref. No. 39** at SRX-HOL00001540; **Ref. No. 41** at SRX-HOL00001792-1794; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. SenoRx has made, used, marketed, offered for sale, sold, supplied, and distributed the Contura knowing that it is especially made or especially adapted for infringing use. **Ref. No. 23** at SRX-HOL5408-5429; **Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55. The Contura is not a staple article or commodity of commerce suitable for substantial non-infringing use. **SUPPORT:** "The SenoRad applicator consists of a multi-lumen catheter connected to an

Asserted Claim[1,2]	Contura™ Multi-Lumen Balloon Source Applicator[3]
	inflatable spherical balloon that can be attached to commercially available High Dose Rate remote afterloader equipment for passage of the radiation source delivery wire. Five radiation source wire lumens are provided; one central lumen located along the long axis of the applicator and four curved lumens symmetrically offset from the central lumen. The balloon is inflated to a 4 or 5 cm spherical shape by a controlled volume injection of physiological saline to approximately 32 or 55 ml, respectively." **Ref. No. 1** at Device description. "The Contura™ MLB Applicator consists of a multi-lumen catheter attached to an inflatable spherical balloon (figure 1). Lumens are provided for attachment to commercially available HDR (High Dose Rate) remote afterloader equipment for passage of the radiation source delivery wire. Five radiation source wire lumens are provided; one central lumen located along the long axis of the applicator and four curved lumens symmetrically offset from the central lumen." **Ref. No. 2** at page 2232. "In addition, the Contura MLB uses vacuum suction to remove excess seroma and air to enhance conformance of often irregularly shaped lumpectomy cavity walls to the balloon surface in order to deliver precise radiation dosing through multiple radiation source lumens." **Ref. No. 5**. An illustration of the Contura™ applicator shows the five treatment lumens, into which the radiation source is inserted, which lumens collectively form the inner spatial volume. **Ref. No. 3.** "The Applicator red-capped radiation source wire lumens are numbered '1', '2', '3', '4' and '5' and positioned as shown in Figure 3. Lumen number '1' corresponds to the offset lumen closest and parallel to the longitudinal radiopaque line (M) along the outside of the catheter. Lumen number '5' corresponds to the central lumen. Remove the red caps and use commercially available connectors to attach the source lumens to the afterloader." **Ref. No. 2** at 232. See generally **Ref. No. 4** (describing insertion of the radioactive seeds into the treatment lumens). See generally **Ref. No. 4** (showing animated depiction of the insertion of radioactive seeds into a treatment lumen).

Asserted Claim[1,2]	Contura™ Multi-Lumen Balloon Source Applicator[3]
	See also evidence attached to Plaintiffs' Motion For Preliminary Injunction, Plaintiffs' Reply Brief In Support of Motion For Preliminary Injunction, and evidence cited in Judge Whyte's Order Denying Plaintiffs' Motion For Preliminary Injunction. *See also* **Ref. No. 24** at 28. *See also* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404, 5408-5429; **Ref. No. 22; Ref. No. 25** at SRX-HOL00003386; **Ref. No. 26; Ref. No. 34** at SRX-HOL00006734, 6780-3784; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 30; Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref. No. 38; Ref. No. 39** at SRX-HOL00001540; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788, 1792-1794; **Ref. No. 42** at SRX-HOL00002016-2019, 2030.
2*. The apparatus of claim 1, wherein the inner and outer spatial volumes are configured to provide a minimum prescribed absorbed dose for delivering therapeutic effects to a target tissue, the target tissue being defined between the outer spatial volume expandable surface and a minimum distance outward from the outer spatial volume expandable surface, the apparatus providing a controlled dose at the outer spatial volume expandable surface to reduce or prevent necrosis in healthy tissue proximate to the expandable surface.*	**CONTENTION:** The Contura™ Multi-Lumen Balloon Catheter is a balloon-based device which is inserted into a cavity remaining after the excision of a breast tumor. Once the balloon is in the cavity, the balloon is inflated with a contrast media or saline (injected through the inflation port) to conform the cavity to the shape of the balloon. Parameters of the balloon size and location are adjusted to conform to the surgical margin of the tissue to the shape of the outer volume of the balloon. Insertion of radiation source wires into select treatment lumens for prescribed lengths of time controls the dose of radiation targeting the tissue to be treated, thereby preventing damage to healthy tissue proximate to the surface of the balloon. This claim element is thus literally infringed. SenoRx Inc. ("SenoRx") makes, uses, offers for sale, and sells an interstitial brachytherapy applicator marketed under the product name Contura™ Multi-Lumen Balloon Source Applicator for Brachytherapy. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-

Asserted Claim[1,2]	Contura™ Multi-Lumen Balloon Source Applicator[3]
	HOL00007179-7186; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404; **Ref. No. 25** at SRX-HOL00003386; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 30; Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref. No. 38; Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. SenoRx also induces and contributes to direct infringement by others of claim 2 by making, using, marketing, offering for sale, selling, supplying, and distributing the Contura™ to physicians and health care facilities for use in treating breast cancer patients. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17**; **Ref. No. 22; Ref. No. 26; Ref. No. 34** at SRX-HOL00006734, 6780-3784; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 37** at SRX-HOL00004778; **Ref. No. 39** at SRX-HOL00001540; **Ref. No. 41** at SRX-HOL00001792-1794; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. SenoRx has made, used, marketed, offered for sale, sold, supplied, and distributed the Contura knowing that it is especially made or especially adapted for infringing use. **Ref. No. 23** at SRX-HOL5408-5429; **Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55. The Contura is not a staple article or commodity of commerce suitable for substantial non-infringing use. **SUPPORT:** "It's a balloon-based device. The balloon is implanted into the breast and it replaces the tissue that was removed by the surgeon. And the goal of the treatment is to treat the rind of the tissue surrounding the balloon. This animation provided to us by the makers of the device shows how it works. After the balloon is inserted into the breast, it is inflated and filled with a saline solution. Then radioactive seeds are sent through five separate channels inside the balloon. The dose is actually directed by where the seed sits within the balloon. So, having one offset from the center of the balloon allows us to pull that dose by leaving the seed in the balloon for a certain period of time – longer than the other side has it for an example. And that means the dosage of the

Asserted Claim[1,2]	Contura™ Multi-Lumen Balloon Source Applicator[3]
	radiation is concentrated on the tumor and doesn't burn the patient's skin. And if the skin was too close to channel 1, we might put the seed longer in channel 3 and 4 versus channel 1 to cool down that side of the dose." **Ref. 4**. "In addition, the Contura MLB uses vacuum suction to remove excess seroma and air to enhance conformance of often irregularly shaped lumpectomy cavity walls to the balloon surface in order to deliver precise radiation dosing through multiple radiation source lumens." **Ref. No. 5**. "8. Using the syringes provided, inflate the Applicator balloon with the contrast media solution to the desired fill volume. Desired balloon diameter — Approximate balloon fill volume 4 cm — 33 ml 5 cm — 58 ml **Ref. No. 2** at 2232. "10. Use ultrasound to confirm appropriate placement, volume and cavity conformance. Fluid and air surrounding the Applicator balloon may be aspirated with a 30 ml Syringe attached to the white Vacuum Port (N). The volume of the balloon may be adjusted through the blue Inflation Port (M). Replace Luer Caps when finished." **Ref. No. 2** at 2232. "RADIATION DELIVERY - Refer to Figure 3 1. CT imaging should he used in conjunction with commercially available treatment planning software to determine the appropriate source lumens, source dwell positions and dwell times for optimized radiation delivery of a prescribed dose to the targeted treatment volume. 2. Note the orientation of the Contura™ MLB Applicator with respect to the radiopaque line on the catheter shaft. Verify correct Applicator orientation, balloon position, balloon volume, skin spacing and conformance using imaging prior to delivery of each fraction of radiation. Adjust if necessary. 3. The Applicator red-capped, radiation source wire lumens are numbered' 1', '2', '3', '4' and '5' and positioned as shown in Figure 3. Lumen number 'l' corresponds to the

Asserted Claim[1,2]	Contura™ Multi-Lumen Balloon Source Applicator[3]
	offset lumen closest and parallel to the longitudinal radiopaque line (M) along the outside of the catheter. Lumen number '5' corresponds to the central lumen. Remove the red caps and use commercially available connectors to attach the source lumens to the afterloader. After each treatment replace the red caps." **Ref. No. 2** at 2232. "Multiple offset lumens provide dose shaping opportunities to minimize skin and rib dose." **Ref. No. 3**. "Vacuum ports enable the removal of fluid & air and facilitate tissue conformance to the balloon for more uniform dosing." **Ref. No. 3.** See generally **Ref. No. 4** showing animated depiction of the insertion and use of the Contura™ device). *See also* evidence attached to Plaintiffs' Motion For Preliminary Injunction, Plaintiffs' Reply Brief In Support of Motion For Preliminary Injunction, and evidence cited in Judge Whyte's Order Denying Plaintiffs' Motion For Preliminary Injunction. *See also* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404, 5408-5429; **Ref. No. 22; Ref. No. 25** at SRX-HOL00003386; **Ref. No. 26; Ref. No. 34** at SRX-HOL00006734, 6780-3784; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 30; Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref. No. 38; Ref. No. 39** at SRX-HOL00001540; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788, 1792-1794; **Ref. No. 42** at SRX-HOL00002016-2019, 2030.
3*. The apparatus of claim 2, wherein a predetermined spacing is provided between said inner spatial volume and the expandable surface element.*	**CONTENTION:** The Contura™ balloon is an "expandable surface element", and is affixed proximate to the vacuum port at the distal end of the applicator catheter. The surface of the expandable balloon defines the outer spatial volume of the balloon applicator. The

Asserted Claim[1,2]	Contura™ Multi-Lumen Balloon Source Applicator[3]
	Contura™ balloon surrounds and contains the inner spatial volume(s) (discussed above). The spacing between the inner spatial volume and the wall of the Contura™ balloon is constant. This claim element is thus literally infringed. SenoRx Inc. ("SenoRx") makes, uses, offers for sale, and sells an interstitial brachytherapy applicator marketed under the product name Contura™ Multi-Lumen Balloon Source Applicator for Brachytherapy. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404; **Ref. No. 25** at SRX-HOL00003386; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 30; Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref. No. 38; Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. SenoRx also induces and contributes to direct infringement by others of claim 3 by making, using, marketing, offering for sale, selling, supplying, and distributing the Contura™ to physicians and health care facilities for use in treating breast cancer patients. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17**; **Ref. No. 22; Ref. No. 26; Ref. No. 34** at SRX-HOL00006734, 6780-3784; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 37** at SRX-HOL00004778; **Ref. No. 39** at SRX-HOL00001540; **Ref. No. 41** at SRX-HOL00001792-1794; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. SenoRx has made, used, marketed, offered for sale, sold, supplied, and distributed the Contura knowing that it is especially made or especially adapted for infringing use. **Ref. No. 23** at SRX-HOL5408-5429; **Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55. The Contura is not a staple article or commodity of commerce suitable for substantial non-infringing use. **SUPPORT:**

Asserted Claim[1,2]	Contura™ Multi-Lumen Balloon Source Applicator[3]
	See also evidence attached to Plaintiffs' Motion For Preliminary Injunction, Plaintiffs' Reply Brief In Support of Motion For Preliminary Injunction, and evidence cited in Judge Whyte's Order Denying Plaintiffs' Motion For Preliminary Injunction. *See also* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404, 5408-5429; **Ref. No. 22; Ref. No. 25** at SRX-HOL00003386; **Ref. No. 26; Ref. No. 34** at SRX-HOL00006734, 6780-3784; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 30; Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref. No. 38; Ref. No. 39** at SRX-HOL00001540; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788, 1792-1794; **Ref. No. 42** at SRX-HOL00002016-2019, 2030..
4. The apparatus of claim 3, wherein the expandable surface element is adapted to contact tissue surrounding a resected cavity and adapted to conform the tissue to the desired shape of the expandable surface element.[4]	**CONTENTION:** Following implantation, the Contura™ balloon is inflated to contact tissue surrounding a resected cavity and to conform the tissue along the resection bed to the three-dimensional shape of the balloon. This claim element is thus literally infringed. SenoRx Inc. ("SenoRx") makes, uses, offers for sale, and sells an interstitial brachytherapy applicator marketed under the product name Contura™ Multi-Lumen Balloon Source Applicator for Brachytherapy. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404; **Ref. No. 25** at SRX-HOL00003386; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-

[4] Claim 4 of the '204 patent contains all of the limitations of claim 36 of the '204 patent (presented in the interests of clarity and economy within Plaintiffs' Motion For Preliminary Injunction as an exemplary claim infringed by SenoRx), plus the additional limitation of the expandable surface element …adapted to contact tissue surrounding a resected cavity and conform the tissue to the desired shape of the expandable surface element.

Asserted Claim[1,2]	Contura™ Multi-Lumen Balloon Source Applicator[3]
	HOL00004197-4215; **Ref. No. 30; Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref. No. 38; Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. SenoRx also induces and contributes to direct infringement by others of claim 4 by making, using, marketing, offering for sale, selling, supplying, and distributing the Contura™ to physicians and health care facilities for use in treating breast cancer patients. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17**; **Ref. No. 22; Ref. No. 26; Ref. No. 34** at SRX-HOL00006734, 6780-3784; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 37** at SRX-HOL00004778; **Ref. No. 39** at SRX-HOL00001540; **Ref. No. 41** at SRX-HOL00001792-1794; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. SenoRx has made, used, marketed, offered for sale, sold, supplied, and distributed the Contura knowing that it is especially made or especially adapted for infringing use. **Ref. No. 23** at SRX-HOL5408-5429; **Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55. The Contura is not a staple article or commodity of commerce suitable for substantial non-infringing use.. **SUPPORT:** "A series of drain holes at the tip of the catheter and at the proximal balloon hub allow for suction to be used to help the lumpectomy cavity conform to the balloon." **Ref. No. 20** at SRX-HOL00004120. "The Applicator is not intended for use in cavities that are too small, too large and/or of shapes unable to conform to an approximately spherical, 4 to 5 cm diameter SenoRx balloon." **Ref. No. 2** at SRX-HOL00002232. "The balloon is inflated to a 4 or 5 cm spherical shape by a controlled volume injection of physiological saline to approximately 33 or 58 ml, respectively. A series of drain holes at the tip of the catheter and at the proximal balloon hub allow for suction to be used to help the lumpectomy cavity conform to the balloon." **Ref. No. 19** at SRX-

Asserted Claim[1,2]	Contura™ Multi-Lumen Balloon Source Applicator[3]
	HOL00005564. "The radiation balloon uses vacuum to remove excess air and fluid and to adhere closely to often irregularly shaped lumpectomy cavities in order to deliver precise radiation dosing through multiple seed lumens." **Ref. No.17** at SRX-HOL00006639. "Use ultrasound to confirm good tissue to balloon conformance and document skin spacing." **Ref. No. 17** at SRX-HOL00006650. "Contour anatomy and target." **Ref. No. 17** at SRX-HOL00006654. *See also* evidence attached to Plaintiffs' Motion For Preliminary Injunction, Plaintiffs' Reply Brief In Support of Motion For Preliminary Injunction, and evidence cited in Judge Whyte's Order Denying Plaintiffs' Motion For Preliminary Injunction. *See also* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404, 5408-5429; **Ref. No. 22; Ref. No. 25** at SRX-HOL00003386; **Ref. No. 26; Ref. No. 34** at SRX-HOL00006734, 6780-3784; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 30; Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref. No. 38; Ref. No. 39** at SRX-HOL00001540; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788, 1792-1794; **Ref. No. 42** at SRX-HOL00002016-2019, 2030.
17. The apparatus of claim 1, wherein the radiation source is a plurality of solid radiation sources arranged to provide an isodose profile having a shape substantially similar to the shape of the outer spatial volume.	**CONTENTION:** The multiple treatment lumens of the Contura allow multiple solid radiation sources to be arrayed simultaneously within two or more separate treatment lumens to provide an isodose profile having a shape substantially similar to the shape of the balloon within the targeted tissue. Alternatively, the multiple treatment lumens of the Contura allow one or more solid radiation sources to be arrayed at different points in time within one or more separate treatment lumens to provide an isodose profile having a shape

Asserted Claim[1,2]	Contura™ Multi-Lumen Balloon Source Applicator[3]
	substantially similar to the shape of the balloon within the targeted tissue. Appropriate pre-treatment dosimetry planning (with multiple dwell locations, multiple dwell times and/or use of multiple lumens) allows the isodose profile to be contoured to be substantially similar to the shape to the outer spatial volume defined by circumference of the expandable balloon. This claim element is thus literally infringed. SenoRx Inc. ("SenoRx") makes, uses, offers for sale, and sells an interstitial brachytherapy applicator marketed under the product name Contura™ Multi-Lumen Balloon Source Applicator for Brachytherapy. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404; **Ref. No. 25** at SRX-HOL00003386; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 30; Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref. No. 38; Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. SenoRx also induces and contributes to direct infringement by others of claim 17 by making, using, marketing, offering for sale, selling, supplying, and distributing the Contura™ to physicians and health care facilities for use in treating breast cancer patients. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17**; **Ref. No. 22; Ref. No. 26; Ref. No. 34** at SRX-HOL00006734, 6780-3784; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 37** at SRX-HOL00004778; **Ref. No. 39** at SRX-HOL00001540; **Ref. No. 41** at SRX-HOL00001792-1794; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. SenoRx has made, used, marketed, offered for sale, sold, supplied, and distributed the Contura knowing that it is especially made or especially adapted for infringing use. **Ref. No. 23** at SRX-HOL5408-5429; **Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55. The Contura is not a staple article or commodity of commerce suitable for substantial non-infringing use.

Asserted Claim[1,2]	Contura™ Multi-Lumen Balloon Source Applicator[3]
	SUPPORT: **Ref. No. 9** at SRX-HOL00006494; **Ref. No. 17** at 6655-6656; **Ref. No. 22** at 10, 16. *See also* evidence attached to Plaintiffs' Motion For Preliminary Injunction, Plaintiffs' Reply Brief In Support of Motion For Preliminary Injunction, and evidence cited in Judge Whyte's Order Denying Plaintiffs' Motion For Preliminary Injunction. *See also* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404, 5408-5429; **Ref. No. 22; Ref. No. 25** at SRX-HOL00003386; **Ref. No. 26; Ref. No. 34** at SRX-HOL00006734, 6780-3784; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 30; Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref. No. 38; Ref. No. 39** at SRX-HOL00001540; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788, 1792-1794; **Ref. No. 42** at SRX-HOL00002016-2019, 2030.

Appendix C

APPENDIX C
INFRINGED CLAIMS OF U.S. Patent No. 6,482,142

Asserted Claim	Contura™ Multi-Lumen Balloon Source Applicator[1]
1. An interstitial brachytherapy apparatus for treating target tissue surrounding a surgical extraction comprising:	**CONTENTION:** The SenoRad Multi-Lumen Balloon Source Applicator ("Contura™") is an interstitial brachytherapy apparatus designed to deliver localized radiation to the margins of the cavity remaining after surgical resection of breast cancer. SenoRx Inc. ("SenoRx") makes, uses, offers for sale, and sells an interstitial brachytherapy applicator marketed under the product name Contura™ Multi-Lumen Balloon Source Applicator for Brachytherapy. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404; **Ref. No. 25** at SRX-HOL00003386; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 30; Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref. No. 38; Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. SenoRx also induces and contributes to direct infringement by others of claim 1 by making, using, marketing, offering for sale, selling, supplying, and distributing the Contura™ to physicians and health care facilities for use in treating breast cancer patients. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17**; **Ref. No. 22; Ref. No. 26; Ref. No. 34** at SRX-HOL00006734, 6780-3784; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 37** at SRX-HOL00004778; **Ref. No. 39** at SRX-HOL00001540; **Ref. No. 41** at SRX-

[1] The "Support" cited herein is exemplary, and although sufficient to support a claim of infringement, is not the complete factual record on which Hologic intends to rely to prove infringement at trial. To the extent that further discovery shows any element of an asserted claim is not present literally, Hologic will rely on the identified evidence to show that the element is present under the doctrine of equivalents.

Asserted Claim	Contura™ Multi-Lumen Balloon Source Applicator[1]
	HOL00001792-1794; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. SenoRx has made, used, marketed, offered for sale, sold, supplied, and distributed the Contura knowing that it is especially made or especially adapted for infringing use. **Ref. No. 23** at SRX-HOL5408-5429; **Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55**.** The Contura is not a staple article or commodity of commerce suitable for substantial non-infringing use. **SUPPORT:** "The SenoRad Multi-Lumen Balloon Source Applicator for Brachytherapy is intended to provide brachytherapy when the physician chooses to deliver intracavitary radiation to the surgical margins following lumpectomy for breast cancer." **Ref. No. 1** at Device description. "The Contura™ MLB Applicator is intended to provide brachytherapy when the physician chooses to deliver intracavitary radiation to the surgical margins following lumpectomy for breast cancer." **Ref. No. 2 at 2232.** "SenoRx, Inc. (NASDAQ:SENO) today announced that it has launched Contura™, its Multi-Lumen Balloon (MLB) Catheter for delivering brachytherapy to the surgical margins following lumpectomy for breast cancer." **Ref. No. 5**. *See also* evidence attached to Plaintiffs' Motion For Preliminary Injunction, Plaintiffs' Reply Brief In Support of Motion For Preliminary Injunction, and evidence cited in Judge Whyte's Order Denying Plaintiffs' Motion For Preliminary Injunction. *See also* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404, 5408-5429; **Ref. No. 22; Ref. No. 25** at SRX-HOL00003386; **Ref. No. 26; Ref. No. 34** at SRX-HOL00006734, 6780-3784; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 30; Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref.**

Asserted Claim	Contura™ Multi-Lumen Balloon Source Applicator[1]
	No. 38; Ref. No. 39 at SRX-HOL00001540; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788, 1792-1794; **Ref. No. 42** at SRX-HOL00002016-2019, 2030.
an expandable outer surface defining a three-dimensional apparatus volume configured to fill an interstitial void created by the surgical extraction of diseased tissue and define an inner boundary of the target tissue being treated;	**CONTENTION:** The outer surface of the inflatable spherical Contura™ multi-lumen balloon (an "expandable surface element") defines the three-dimensional apparatus volume that fills the interstitial void of the resection cavity. The expanded balloon conforms the cavity to the balloon shape and thereby defines the inner boundary of target tissue along the cavity wall that is being treated. This claim element is thus literally infringed. **SUPPORT:** "The SenoRad applicator consists of a multi-lumen catheter connected to an inflatable spherical balloon that can be attached to commercially available High Dose Rate remote afterloader equipment for passage of the radiation source delivery wire. Five radiation source wire lumens are provided; one central lumen located along the long axis of the applicator and four curved lumens symmetrically offset from the central lumen. The balloon is inflated to a 4 or 5 cm spherical shape by a controlled volume injection of physiological saline to approximately 32 or 55 ml, respectively." **Ref. No. 1** at Device description. "The Contura™ MLB Applicator consists of a multi-lumen catheter attached to an inflatable spherical balloon (figure 1)." **Ref. No. 2 at 2232.** "The applicator is not intended for use in cavities that are too small, too large and/or of shapes unable to conform to an approximately spherical, 4 to 5 cm diameter SenoRx balloon." **Ref. No. 2 at 2232.** "8. Using the syringes provided, inflate the Applicator balloon with the contrast media solution to the desired fill volume. Desired balloon diameter — Approximate balloon fill volume 4 cm — 33 ml 5 cm — 58 ml **Ref. No. 2** at 2232.

Asserted Claim	Contura™ Multi-Lumen Balloon Source Applicator[1]
	An illustration of the Contura™ applicator shows the three-dimensional apparatus volume defined by the expandable polyurethane balloon to be inflated in the resection cavity. **Ref. No. 3**. "It's a balloon-based device. The balloon is implanted into the breast and it replaces the tissue that was removed by the surgeon. And the goal of the treatment is to treat the rind of the tissue surrounding the balloon. This animation provided to us by the makers of the device shows how it works. After the balloon is inserted into the breast, it is inflated and filled with a saline solution." **Ref. 4**. See generally **Ref. No. 4** (showing expansion of balloon with subsequent increase in the three-dimensional apparatus volume). "SenoRx has developed Contura™, a multi-lumen radiation balloon applicator for accelerated partial breast irradiation. The radiation balloon uses vacuum to remove excess fluid and to adhere closely to often irregularly shaped lumpectomy cavities in order to deliver precise radiation dosing through multiple seed lumens." **Ref. No. 6** *See also* evidence attached to Plaintiffs' Motion For Preliminary Injunction, Plaintiffs' Reply Brief In Support of Motion For Preliminary Injunction, and evidence cited in Judge Whyte's Order Denying Plaintiffs' Motion For Preliminary Injunction.
a radiation source disposed completely within the expandable outer surface and located so as to be spaced apart from the apparatus volume,	**CONTENTION:** Each radiation source ("radiation source wire") is inserted through a radiation source lumen in the Contura into its respective central or curved treatment lumen. The five treatment lumens are located within the expandable outer surface of the balloon, and do not contact the expandable outer surface of the device, which defines the apparatus volume. This claim element is thus literally infringed. SenoRx also induces and contributes to direct infringement by others of claim 1 by making, using, marketing, offering for sale, selling, supplying, and distributing the Contura™ to physicians and health care facilities for use in treating breast cancer patients. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17**; **Ref. No. 22; Ref. No. 26; Ref. No. 34** at SRX-

Asserted Claim	Contura™ Multi-Lumen Balloon Source Applicator[1]
	HOL00006734, 6780-3784; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 37** at SRX-HOL00004778; **Ref. No. 39** at SRX-HOL00001540; **Ref. No. 41** at SRX-HOL00001792-1794; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. SenoRx has made, used, marketed, offered for sale, sold, supplied, and distributed the Contura knowing that it is especially made or especially adapted for infringing use. **Ref. No. 23** at SRX-HOL5408-5429; **Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55**.** The Contura is not a staple article or commodity of commerce suitable for substantial non-infringing use. **SUPPORT:** "The SenoRad applicator consists of a multi-lumen catheter connected to an inflatable spherical balloon that can be attached to commercially available High Dose Rate remote afterloader equipment for passage of the radiation source delivery wire. Five radiation source wire lumens are provided; one central lumen located along the long axis of the applicator and four curved lumens symmetrically offset from the central lumen. The balloon is inflated to a 4 or 5 cm spherical shape by a controlled volume injection of physiological saline to approximately 32 or 55 ml, respectively." **Ref. No. 1** at Device description. "The Contura™ MLB Applicator consists of a multi-lumen catheter attached to an inflatable spherical balloon (figure 1). Lumens are provided for attachment to commercially available HDR (High Dose Rate) remote afterloader equipment for passage of the radiation source delivery wire. Five radiation source wire lumens are provided; one central lumen located along the long axis of the applicator and four curved lumens symmetrically offset from the central lumen." **Ref. No. 2** at page 2232. "It's a balloon-based device. The balloon is implanted into the breast and it replaces the tissue that was removed by the surgeon. And the goal of the treatment is to treat the rind of the tissue surrounding the balloon. This animation provided to us by the makers of the device shows how it works. After the balloon is inserted into the breast, it is inflated and filled with a saline solution. Then radioactive seeds are sent through five separate channels inside the balloon. The dose is actually directed by where the

Asserted Claim	Contura™ Multi-Lumen Balloon Source Applicator[1]
	seed sits within the balloon. So, having one offset from the center of the balloon allows us to pull that dose by leaving the seed in the balloon for a certain period of time – longer than the other side has it for an example. And that means the dosage of the radiation is concentrated on the tumor and doesn't burn the patient's skin. And if the skin was too close to channel 1, we might put the seed longer in channel 3 and 4 versus channel 1 to cool down that side of the dose." **Ref. 4**. "In addition, the Contura MLB uses vacuum suction to remove excess seroma and air to enhance conformance of often irregularly shaped lumpectomy cavity walls to the balloon surface in order to deliver precise radiation dosing through multiple radiation source lumens." **Ref. No. 5**. An illustration of the Contura™ applicator shows the five treatment lumens (into which the radiation sources are inserted) located within the center of the expandable outer surface of the balloon. Ex. C. **Ref. No. 3.** "The Applicator red-capped radiation source wire lumens are numbered '1', '2', '3', '4' and '5' and positioned as shown in Figure 3. Lumen number '1' corresponds to the offset lumen closest and parallel to the longitudinal radiopaque line (M) along the outside of the catheter. Lumen number '5' corresponds to the central lumen. Remove the red caps and use commercially available connectors to attach the source lumens to the afterloader." **Ref. No. 2** at 2232. See generally **Ref. No. 4** (showing animated depiction of, and describing insertion of the radioactive seeds into the treatment lumens). *See also* evidence attached to Plaintiffs' Motion For Preliminary Injunction, Plaintiffs' Reply Brief In Support of Motion For Preliminary Injunction, and evidence cited in Judge Whyte's Order Denying Plaintiffs' Motion For Preliminary Injunction. *See also* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404, 5408-5429; **Ref. No. 22; Ref. No. 25** at SRX-HOL00003386; **Ref. No. 26; Ref. No. 34** at SRX-HOL00006734, 6780-3784; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 30; Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55; **Ref. No. 33** at SRX-

Asserted Claim	Contura™ Multi-Lumen Balloon Source Applicator[1]
	HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref. No. 38; Ref. No. 39** at SRX-HOL00001540; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788, 1792-1794; **Ref. No. 42** at SRX-HOL00002016-2019, 2030.
the radiation source further being asymmetrically located and arranged within the expandable surface to provide predetermined asymmetric isodose curves with respect to the apparatus volume.	**CONTENTION:** Each radiation source ("radiation source wire") is inserted through a radiation source lumen into its respective central or curved treatment lumen. All of the treatment lumens are spaced apart from the apparatus volume (e.g., not touching the interior surface of the balloon), and are arranged asymmetrically with respect to the longitudinal axis of the catheter by the treating physician so as to irradiate the desired target tissue. The isodose surfaces or curves that are generated by the accused device will have a predetermined asymmetry with respect to the balloon. One way in which this asymmetric dosing is achieved is by varying the duration of time radioactive seeds reside within select treatment lumens. Commercially available treatment planning software is used by the physician to determine the appropriate parameters of the dosing for optimized radiation delivery of a prescribed dose to the targeted treatment volume. The optimized radiation delivery is reflected in asymmetric isodose curves. This claim element is thus literally infringed. SenoRx also induces and contributes to direct infringement by others of claim 1 by making, using, marketing, offering for sale, selling, supplying, and distributing the Contura™ to physicians and health care facilities for use in treating breast cancer patients. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17**; **Ref. No. 22; Ref. No. 26; Ref. No. 34** at SRX-HOL00006734, 6780-3784; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 37** at SRX-HOL00004778; **Ref. No. 39** at SRX-HOL00001540; **Ref. No. 41** at SRX-HOL00001792-1794; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. SenoRx has made, used, marketed, offered for sale, sold, supplied, and distributed the Contura knowing that it is especially made or especially adapted for infringing use. **Ref. No. 23** at SRX-HOL5408-5429; **Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at

Asserted Claim	Contura™ Multi-Lumen Balloon Source Applicator[1]
	HOLOGIC0048754-55. The Contura is not a staple article or commodity of commerce suitable for substantial non-infringing use. **SUPPORT:** "The SenoRad applicator consists of a multi-lumen catheter connected to an inflatable spherical balloon that can be attached to commercially available High Dose Rate remote afterloader equipment for passage of the radiation source delivery wire. Five radiation source wire lumens are provided; one central lumen located along the long axis of the applicator and four curved lumens symmetrically offset from the central lumen. The balloon is inflated to a 4 or 5 cm spherical shape by a controlled volume injection of physiological saline to approximately 32 or 55 ml, respectively." **Ref. No. 1** at Device description. "The Contura™ MLB Applicator consists of a multi-lumen catheter attached to an inflatable spherical balloon (figure 1). Lumens are provided for attachment to commercially available HDR (High Dose Rate) remote afterloader equipment for passage of the radiation source delivery wire. Five radiation source wire lumens are provided; one central lumen located along the long axis of the applicator and four curved lumens symmetrically offset from the central lumen." **Ref. No. 2** at page 2232. "RADIATION DELIVERY - Refer to Figure 3 1. CT imaging should he used in conjunction with commercially available treatment planning software to determine the appropriate source lumens, source dwell positions and dwell times for optimized radiation delivery of a prescribed dose to the targeted treatment volume." **Ref. No. 2** at 2232. "In addition, the Contura MLB uses vacuum suction to remove excess seroma and air to enhance conformance of often irregularly shaped lumpectomy cavity walls to the balloon surface in order to deliver precise radiation dosing through multiple radiation source lumens." **Ref. No. 5**. An illustration of the Contura™ applicator shows the five treatment lumens, the outer spatial volume as defined by the expandable polyurethane balloon, and the inner spatial volume. **Ref. No. 3.**

Asserted Claim	Contura™ Multi-Lumen Balloon Source Applicator[1]
	"The Applicator red-capped radiation source wire lumens are numbered '1', '2', '3', '4' and '5' and positioned as shown in Figure 3. Lumen number '1' corresponds to the offset lumen closest and parallel to the longitudinal radiopaque line (M) along the outside of the catheter. Lumen number '5' corresponds to the central lumen. Remove the red caps and use commercially available connectors to attach the source lumens to the afterloader." **Ref. No. 2** at 2232. "It's a balloon-based device. The balloon is implanted into the breast and it replaces the tissue that was removed by the surgeon. And the goal of the treatment is to treat the rind of the tissue surrounding the balloon. This animation provided to us by the makers of the device shows how it works. After the balloon is inserted into the breast, it is inflated and filled with a saline solution. Then radioactive seeds are sent through five separate channels inside the balloon. The dose is actually directed by where the seed sits within the balloon. So, having one offset from the center of the balloon allows us to pull that dose by leaving the seed in the balloon for a certain period of time – longer than the other side has it for an example. And that means the dosage of the radiation is concentrated on the tumor and doesn't burn the patient's skin. And if the skin was too close to channel 1, we might put the seed longer in channel 3 and 4 versus channel 1 to cool down that side of the dose." **Ref. 4**. See generally **Ref. No. 4** (describing insertion of the radioactive seeds into the treatment lumens, showing animated depiction of the asymmetric treatment achieved by insertion of radioactive seeds into a select treatment lumen, and showing animated depiction of asymmetric isodose curves). *See also* evidence attached to Plaintiffs' Motion For Preliminary Injunction, Plaintiffs' Reply Brief In Support of Motion For Preliminary Injunction, and evidence cited in Judge Whyte's Order Denying Plaintiffs' Motion For Preliminary Injunction. *See also* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404, 5408-5429; **Ref. No. 22; Ref. No. 25** at SRX-HOL00003386; **Ref. No. 26; Ref. No. 34** at SRX-HOL00006734, 6780-3784; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 30; Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55; **Ref. No. 33** at SRX-

Asserted Claim	Contura™ Multi-Lumen Balloon Source Applicator[1]
	HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref. No. 38; Ref. No. 39** at SRX-HOL00001540; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788, 1792-1794; **Ref. No. 42** at SRX-HOL00002016-2019, 2030.
6. A surgical apparatus for providing radiation treatment to target tissue comprising:	**CONTENTION:** The SenoRad Multi-Lumen Balloon Source Applicator ("Contura™") is an interstitial brachytherapy apparatus designed to deliver localized radiation to the margins of the cavity remaining after surgical resection of breast cancer. SenoRx Inc. ("SenoRx") makes, uses, offers for sale, and sells an interstitial brachytherapy applicator marketed under the product name Contura™ Multi-Lumen Balloon Source Applicator for Brachytherapy. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404; **Ref. No. 25** at SRX-HOL00003386; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 30; Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref. No. 38; Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. SenoRx also induces and contributes to direct infringement by others of claim 6 by making, using, marketing, offering for sale, selling, supplying, and distributing the Contura™ to physicians and health care facilities for use in treating breast cancer patients. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17**; **Ref. No. 22; Ref. No. 26; Ref. No. 34** at SRX-HOL00006734, 6780-3784; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 37** at SRX-HOL00004778; **Ref. No. 39** at SRX-HOL00001540; **Ref. No. 41** at SRX-HOL00001792-1794; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 42** at SRX-HOL00002016-2019, 2030.

Asserted Claim	Contura™ Multi-Lumen Balloon Source Applicator[1]
	SenoRx has made, used, marketed, offered for sale, sold, supplied, and distributed the Contura knowing that it is especially made or especially adapted for infringing use. **Ref. No. 23** at SRX-HOL5408-5429; **Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55**.** The Contura is not a staple article or commodity of commerce suitable for substantial non-infringing use. **SUPPORT:** "The SenoRad Multi-Lumen Balloon Source Applicator for Brachytherapy is intended to provide brachytherapy when the physician chooses to deliver intracavitary radiation to the surgical margins following lumpectomy for breast cancer." **Ref. No. 1** at Device description. "The Contura™ MLB Applicator is intended to provide brachytherapy when the physician chooses to deliver intracavitary radiation to the surgical margins following lumpectomy for breast cancer." **Ref. No. 2 at 2232.** "SenoRx, Inc. (NASDAQ:SENO) today announced that it has launched Contura™, its Multi-Lumen Balloon (MLB) Catheter for delivering brachytherapy to the surgical margins following lumpectomy for breast cancer." **Ref. No. 5**. *See also* evidence attached to Plaintiffs' Motion For Preliminary Injunction, Plaintiffs' Reply Brief In Support of Motion For Preliminary Injunction, and evidence cited in Judge Whyte's Order Denying Plaintiffs' Motion For Preliminary Injunction. *See also* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404, 5408-5429; **Ref. No. 22; Ref. No. 25** at SRX-HOL00003386; **Ref. No. 26; Ref. No. 34** at SRX-HOL00006734, 6780-3784; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 30; Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref. No. 38; Ref. No. 39** at SRX-HOL00001540; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788, 1792-1794; **Ref. No. 42** at SRX-

Asserted Claim	Contura™ Multi-Lumen Balloon Source Applicator[1]
	HOL00002016-2019, 2030.
an expandable outer surface defining an apparatus volume;	**CONTENTION:** The outer surface of the inflatable spherical Contura™ multi-lumen balloon is an expandable surface element, and defines the three-dimensional apparatus volume that fills the resection cavity. This claim element is thus literally infringed. **SUPPORT:** "The SenoRad applicator consists of a multi-lumen catheter connected to an inflatable spherical balloon that can be attached to commercially available High Dose Rate remote afterloader equipment for passage of the radiation source delivery wire. Five radiation source wire lumens are provided; one central lumen located along the long axis of the applicator and four curved lumens symmetrically offset from the central lumen. The balloon is inflated to a 4 or 5 cm spherical shape by a controlled volume injection of physiological saline to approximately 32 or 55 ml, respectively." **Ref. No. 1** at Device description. "The Contura™ MLB Applicator consists of a multi-lumen catheter attached to an inflatable spherical balloon (figure 1)." **Ref. No. 2 at 2232.** "The applicator is not intended for use in cavities that are too small, too large and/or of shapes unable to conform to an approximately spherical, 4 to 5 cm diameter SenoRx balloon." **Ref. No. 2 at 2232.** "8. Using the syringes provided, inflate the Applicator balloon with the contrast media solution to the desired fill volume. Desired balloon diameter — Approximate balloon fill volume 4 cm — 33 ml 5 cm — 58 ml **Ref. No. 2** at 2232. An illustration of the Contura™ applicator shows the three-dimensional apparatus volume defined by the expandable polyurethane balloon to be inflated in the resection cavity. **Ref. No. 3**.

Asserted Claim	Contura™ Multi-Lumen Balloon Source Applicator[1]
	"It's a balloon-based device. The balloon is implanted into the breast and it replaces the tissue that was removed by the surgeon. And the goal of the treatment is to treat the rind of the tissue surrounding the balloon. This animation provided to us by the makers of the device shows how it works. After the balloon is inserted into the breast, it is inflated and filled with a saline solution." **Ref. 4**. See generally **Ref. No. 4** (showing expansion of balloon with subsequent increase in the three-dimensional apparatus volume). "SenoRx has developed Contura™, a multi-lumen radiation balloon applicator for accelerated partial breast irradiation. The radiation balloon uses vacuum to remove excess fluid and to adhere closely to often irregularly shaped lumpectomy cavities in order to deliver precise radiation dosing through multiple seed lumens." **Ref. No. 6** *See also* evidence attached to Plaintiffs' Motion For Preliminary Injunction, Plaintiffs' Reply Brief In Support of Motion For Preliminary Injunction, and evidence cited in Judge Whyte's Order Denying Plaintiffs' Motion For Preliminary Injunction.
a radiation source replaceably disposable within the expandable outer surface, the radiation source comprising a plurality of solid radiation sources arranged to provide predetermined asymmetric isodose curves within the target tissue, the plurality of radiation sources being provided on at least two elongate members extending into the apparatus volume, at least one of the elongate members being shaped to provide asymmetric placement of a radiation source with respect to a longitudinal axis through the apparatus volume.	**CONTENTION:** The radiation source wires are inserted into the treatment lumens within the Contura balloon during treatment and removed after the desired fractional dose has been delivered, thereby satisfying the requirement of a radiation source that is "replaceably disposable within the expandable outer surface." The multiple treatment lumens of the Contura allow multiple solid radiation sources (e.g., single radionuclide sources on multiple separate source wires) to be arrayed simultaneously within two or more separate treatment lumens so as to irradiate a select area of tissue with a dose that has predetermined asymmetric isodose curves. Alternatively, the multiple treatment lumens of the Contura allow one or more solid radiation sources to be arrayed at different points in time within one or more separate treatment lumens to provide an isodose profile having a shape substantially similar to the shape of the balloon within the targeted tissue. The offset treatment lumens are curved to provide asymmetric placement of the radiation source with respect to the central treatment lumen which traces the longitudinal axis through the treatment volume. This claim element is thus literally infringed. SenoRx also induces and contributes to direct infringement by others of claim 1 by making, using, marketing, offering for sale, selling, supplying, and distributing the

Asserted Claim	Contura™ Multi-Lumen Balloon Source Applicator[1]
	Contura™ to physicians and health care facilities for use in treating breast cancer patients. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17**; **Ref. No. 22; Ref. No. 26; Ref. No. 34** at SRX-HOL00006734, 6780-3784; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 37** at SRX-HOL00004778; **Ref. No. 39** at SRX-HOL00001540; **Ref. No. 41** at SRX-HOL00001792-1794; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. SenoRx has made, used, marketed, offered for sale, sold, supplied, and distributed the Contura knowing that it is especially made or especially adapted for infringing use. **Ref. No. 23** at SRX-HOL5408-5429; **Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55**.** The Contura is not a staple article or commodity of commerce suitable for substantial non-infringing use. **SUPPORT:** "The radiation balloon uses vacuum to remove excess air and fluid and to adhere closely to often irregularly shaped lumpectomy cavities in order to deliver precise radiation dosing through multiple seed lumens." **Ref. No. 17** at SRX-HOL00006639. "Each lumen can accommodate 8 dwell positions." **Ref. No. 17** at SRX-HOL00006642. "8 dwell positions are available within each lumen. 5 lumens x 8 dwell positions=40 possible dwell positions for each patient!" **Ref. No. 16** at SRX-HOL00006600 *See also* evidence attached to Plaintiffs' Motion For Preliminary Injunction, Plaintiffs' Reply Brief In Support of Motion For Preliminary Injunction, and evidence cited in Judge Whyte's Order Denying Plaintiffs' Motion For Preliminary Injunction. *See also* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404, 5408-5429; **Ref. No. 22; Ref. No. 25** at SRX-HOL00003386; **Ref. No. 26; Ref. No. 34** at

Asserted Claim	Contura™ Multi-Lumen Balloon Source Applicator[1]
	SRX-HOL00006734, 6780-3784; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 30; Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref. No. 38; Ref. No. 39** at SRX-HOL00001540; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788, 1792-1794; **Ref. No. 42** at SRX-HOL00002016-2019, 2030.
8. The apparatus of claim 1, wherein the expandable outer surface is sufficiently rigid to deform the target tissue into the shape of the expandable outer surface, causing the predetermined asymmetric isodose curves to penetrate into the target tissue to a prescribed depth.	**CONTENTION:** The SenoRad Multi-Lumen Balloon Source Applicator ("Contura™") is an interstitial brachytherapy apparatus designed to deliver localized radiation to the margins of the cavity remaining after surgical resection of breast cancer. The Contura™ is inserted into a cavity remaining after the excision of a breast tumor. Once the balloon is in the cavity, the balloon is inflated with a contrast media or saline (injected through the inflation port). The Contura balloon is sufficiently rigid to conform the cavity to the shape of the balloon. Parameters of the balloon size and location are adjusted to conform to the surgical margin of the tissue to the shape of the outer volume of the balloon. Once the resection cavity has been conformed to the shape of the expandable outer surface, insertion of radiation source wires into select treatment lumens for prescribed lengths of time controls the dose of radiation targeting the tissue, so as to irradiate a select area of tissue with a dose that has predetermined asymmetric isodose curves., thereby preventing damage to healthy tissue proximate to the surface of the balloon. This claim element is thus literally infringed. SenoRx Inc. ("SenoRx") makes, uses, offers for sale, and sells an interstitial brachytherapy applicator marketed under the product name Contura™ Multi-Lumen Balloon Source Applicator for Brachytherapy. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404; **Ref. No. 25** at SRX-HOL00003386; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 30; Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref. No. 38; Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788; **Ref. No.**

Asserted Claim	Contura™ Multi-Lumen Balloon Source Applicator[1]
	42 at SRX-HOL00002016-2019, 2030.. SenoRx also induces and contributes to direct infringement by others of claim 8 by making, using, marketing, offering for sale, selling, supplying, and distributing the Contura™ to physicians and health care facilities for use in treating breast cancer patients. *See* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17**; **Ref. No. 22; Ref. No. 26; Ref. No. 34** at SRX-HOL00006734, 6780-3784; **Ref. No. 28** at SRX-HOL00004163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 37** at SRX-HOL00004778; **Ref. No. 39** at SRX-HOL00001540; **Ref. No. 41** at SRX-HOL00001792-1794; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 42** at SRX-HOL00002016-2019, 2030. SenoRx has made, used, marketed, offered for sale, sold, supplied, and distributed the Contura knowing that it is especially made or especially adapted for infringing use. **Ref. No. 23** at SRX-HOL5408-5429; **Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55**.** The Contura is not a staple article or commodity of commerce suitable for substantial non-infringing use. **SUPPORT:** *See also* evidence attached to Plaintiffs' Motion For Preliminary Injunction, Plaintiffs' Reply Brief In Support of Motion For Preliminary Injunction, and evidence cited in Judge Whyte's Order Denying Plaintiffs' Motion For Preliminary Injunction. *See also* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404, 5408-5429. *See also* **Ref. No. 7***;* **Ref. No. 8**; **Ref. No. 10** at SRX-HOL00002354; **Ref. No. 11** at SRX-HOL00002360-2362; **Ref. No. 12** at 1, 2; **Ref. No. 13** at 39; **Ref. No. 14** at SRX-HOL00002371, 2373; **Ref. No. 15** at SRX-HOL00007179-7186; **Ref. No. 16** at SRX-HOL00006591-6601; **Ref. No. 17; Ref. No. 23** at SRX-HOL00005396, 5404, 5408-5429; **Ref. No. 22; Ref. No. 25** at SRX-HOL00003386; **Ref. No. 26; Ref. No. 34** at

Asserted Claim	Contura™ Multi-Lumen Balloon Source Applicator[1]
	SRX-HOL00006734, 6780-3784; **Ref. No. 27; Ref. No. 28** at SRX-HOL00004140-4149, 4163-4195; **Ref. No. 29** at SRX-HOL00004197-4215; **Ref. No. 30; Ref. No. 31** at HOLOGIC0048742; **Ref. No. 32** at HOLOGIC0048754-55; **Ref. No. 33** at SRX-HOL00004457-4459; **Ref. No. 34** at SRX-HOL00006734, 6740, 6743-6745, 6760-6773, 6780-3784; **Ref. No. 35; Ref. No. 36; Ref. No. 37** at SRX-HOL00004778; **Ref. No. 38; Ref. No. 39** at SRX-HOL00001540; **Ref. No. 40** at SRX-HOL00001675-1688, 1692-1702; **Ref. No. 41** at SRX-HOL00001784-1788, 1792-1794; **Ref. No. 42** at SRX-HOL00002016-2019, 2030.

Appendix D

APPENDIX D
Materials Relied Upon and Cited Within the Infringement Charts

Ref. No.	Document Description
1	SenoRx's 510(k) Summary for SenoRad Multi-Lumen Balloon Source Applicator for Brachytherapy [SRX-HOL0000 6605-6606]
2	Contura™ Multi-Lumen Balloon Source Applicator for Brachytherapy- Instructions for Use [SRX-HOL00002232-2233]
3	Contura brochure, posted at *http://www.senorx.com/images/SNRX_7000_conturads_7.jpg* [SRX-HOL00003402]
4	Contura™ Balloon Applicator Insertion Procedure and Radiation Procedure Animation, posted at *http://www.myfoxphoenix.com/myfox/pages/Home/Detail;jsessionid=18E5571CEC66E18169DF1494828ED0A5?contentId=5126377&version=1&locale=EN-US&layoutCode=VSTY&pageId=1.1.1&sflg=1*
5	SenoRx press release, January 17, 2008, posted at *http://www.senorx.com/siteadmin/files/SenoRxLaunchesContura.pdf*
6	SenoRx webpage discussing Contura™, posted at *http://www.senorx.com/teatment.asp* [HOLOGIC0048885-48887]
7	Gearhart Email re conference call with Contura Targets.xls attachment [SRX-HOL00006882-6898]
8	Sales spreadsheet [SRX-HOL00003362-3379]
9	Contura Multi-Lumen Balloon: Product Overview and Dosimetry [SRX-HOL00006487-6497]
10	Canaccord Adams Flash Update 19 February 2008 [SRX-HOL00002354-2358]
11	Canaccord Adams Flash Update 20 February 2008 [SRX-HOL00002360-2370]
12	Press Release: "SenoRx Reports Revenue Growth of 43.2 Percent in Q4 2007 Compared with Q4 2006" (Ex-99.1 to SenoRx 8-K, filed February 19, 2008), posted at *http://www.sec.gov/Archives/edgar/data/1097136/000119312508033236/dex991.htm*
13	SenoRx 10-K for fiscal year ending December 31, 2007, posted at *http://www.sec.gov/Archives/edgar/data/1097136/000119312508062802/d10k.htm* [HOLOGIC0048793-48884]
14	CitiGroup Global Markets February 19, 2008 Company Focus: SenoRx, Inc. [SRX-HOL00002371-2379]
15	2008 Contura Market Plan, dated December 20th, 2007 [SRX-HOL00007170-7187]
16	SenoRx document "How to set up an account for Contura [SRX-HOL00006591-6611]
17	SenoRx sales training manual [SRX-HOL00006616-6686]

18	SenoRx sales invoices, returned goods authorizations, shipping requests, sales orders, price list, ordering information, and related materials [SRX-HOL00000523-1503]
19	Contura MLB Source Applicator For Brachytherapy-Special 510(K) [SRX-HOL00005564-5565]
20	Risk Analysis Report: Contura MLB Brachytherapy Applicator [SRX-HOL00004119-4128]
21	Technical Drawings- [SRX-HOL00004861-4863, 4877-4878, 4933-4934]
22	Exhibit G to Plaintiffs' Amended Complaint [HOLOGIC0048776-48792]
23	MammoSite Instructions For Use [SRX-HOL00005396-5429]
24	April 27, 2007 Claim Construction Order for *Xoft* litigation (Case NO. C-05-05312 RMW)
25	SenoRx Fourth Quarter/FY 2007 Conference call [SRX-HOL00003380-3397]
26	Multi-Site Prospective, Non-Randomized Study Utilizing The Contura™ Multi-Lumen Balloon (MLB) Breast Brachytherapy Applicator To Deliver Accelerated Partial Breast Irradiation: Analysis of Dosimetric Success, Local Tumor Control, Cosmetic Outcome, Acute and Chronic Toxicity, and Clinical Scenarios For Optimal Use [SRX-HOL00003312-3361]
27	Design History File Checklist [SRX-HOL00004092-4093]
28	Dosimetric Comparative Analysis of MammoSite and SenoRx catheters [SRX-HOL00004140-4195]
29	Comparison between MammoSite and SenoRx when using the offset Catheters [SRX-HOL00004197-4215]
30	Radiation Balloon Dosimetry Measurement [SRX-HOL00004237-4455]
31	U.S. Patent No. 6,923,754 (Lubbock) [HOLOGIC0048742-48753]
32	U.S. Patent No. 6,955,641 (Lubbock) [HOLOGIC0048754-48775]
33	Tests for Compliance of the SenoRx balloon catheter device with the Varian Varisource and GammaMed afterloaders [SRX-HOL4457-4460]
34	Contura Multi-Lumen Balloon: Expanding your Treatment Possibilities [SRX-HOL00006733-6786]
35	SenoRx Radiation Balloon Product Specification [SRX-HOL00004601-4603]
36	Communication Dorin Todor to Paul Lubbock [SRX-HOL00004231-4235]
37	Contura Multi-Lumen Balloon-Expanding Your Treatment Possibilities [SRX-HOL00004776-4778]
38	Contura 4-5 Cm Inflation Volume vs. Balloon Diameter {XRS-HOL00003738-3746]
39	SenoRx Inc. Board of Directors' Meeting June 14, 2007 [SRX-HOL00001504-1664]

40	**SenoRx Inc. Board of Directors' Meeting September 26, 2007 [SRX-HOL00001665-1774]**
41	**SenoRx Inc. Board of Directors' Meeting December 2, 2007 [SRX-HOL00001775-1954]**
42	**SenoRx Inc. Board of Directors' Meeting February 27, 2008 [SRX-HOL00001955-2048]**

Exhibit 5

Henry C. Su (SBN 211202; suh@howrey.com)
Katharine L. Altemus (SBN 227080; altemusk@howrey.com)
HOWREY LLP
1950 University Avenue, 4th Floor
East Palo Alto, California 94303
Telephone: (650) 798-3500
Facsimile: (650) 798-3600

Robert Ruyak
Matthew Wolf (Admitted *Pro Hac Vice*)
Marc Cohn (Admitted *Pro Hac Vice*)
HOWREY LLP
1299 Pennsylvania Avenue, NW
Washington, DC 20004
Telephone: (202) 783-0800
Facsimile: (202) 383-6610

Attorneys for Plaintiffs
HOLOGIC, INC., CYTYC CORPORATION and HOLOGIC L.P.

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN JOSE DIVISION

HOLOGIC, INC., CYTYC CORPORATION, and HOLOGIC L.P.,

Plaintiffs,

vs.

SENORX, INC.,

Defendant.

AND RELATED COUNTERCLAIMS.

Case No. C08 00133 RMW (RS)

PLAINTIFFS' PRELIMINARY CLAIM CONSTRUCTION, AND IDENTIFICATION OF STRUCTURE CORRESPONDING TO § 112(6) ELEMENTS FOR U.S. PATENT NOS. 5,913,813, 6,413,204, AND 6,482,142, AND PRELIMINARY IDENTIFICATION OF EVIDENCE PURSUANT TO PATENT LOCAL RULE 4-2

Pursuant to the parties' Proposed Stipulated Scheduling Order and Patent Local Rule 4-2(a) and (b), Plaintiffs' Hologic, Inc, Cytyc Corporation, and Hologic L.P. (collectively, "Hologic") hereby provide their Preliminary Claim Construction, Identification of Structure

Corresponding to § 112(6) Elements, and Preliminary Identification of Extrinsic and Intrinsic Evidence for certain terms, phrases and clauses in the asserted claims of U.S. Patent Nos. 5,913,813 (the "'813 patent"), 6,413,204 (the "'204 patent"), and 6,482,142 (the "'142 patent"), attached hereto at Exhibits A, B, and C, respectively.

The claim constructions proposed in Exhibits A, B, and C are preliminary in nature, and Hologic reserves the right to modify, amend, alter, and/or supplement these proposed claim constructions. Hologic further reserves the right to modify and/or supplement the intrinsic and extrinsic evidence cited in support of its proposed claim constructions including, without limitation, the identification of supporting expert testimony. Hologic will provide a final statement of whether it intends to present expert testimony and a summary of such testimony in accordance with Patent Local Rule 4-3 and the schedule set forth in the parties' agreed Scheduling Order.

Hologic believes that any additional claim terms, phrases and clauses that SenoRx, Inc. ("SenoRx") identified as requiring construction should be accorded their plain and ordinary meaning and do not require construction by the Court. Hologic reserves the right, however, to offer its own proposed constructions of any such additional claim terms, phrases and clauses upon review of and in response to SenoRx's proposed claim constructions, and as part of the parties' meet and confer process under Patent Local Rule 4-2(c).

Nothing in the proposed constructions in Exhibits A, B, and C is intended as an admission that any claim term, phrase or clause has a particular meaning in the asserted claims of the '813, '204, and/or '142 patents. Hologic expressly reserves the right to amend its contentions with respect to the

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meaning of any claim term or phrase as the parties meet and confer pursuant to Patent Local Rule 4-2(c) or as discovery proceeds.

Dated: May 12, 2008

HOWREY LLP

By: _____
Katharine L. Altemus

HOWREY LLP
Attorneys for Plaintiffs
Hologic, Inc., Cytyc Corporation,
and Hologic L.P.

PROOF OF SERVICE

I am employed in the County of San Mateo, State of California. I am over the age of 18 and not a party to the within action. My business address is 1950 University Avenue, 4th Floor, East Palo Alto, California 94303.

On May 12, 2008, I served on the interested parties in said action the within:

PLAINTIFFS' PRELIMINARY CLAIM CONSTRUCTION, AND IDENTIFICATION OF STRUCTURE CORRESPONDING TO § 112(6) ELEMENTS FOR U.S. PATENT NOS. 5,913,813, 6,413,204, AND 6,482,142, AND PRELIMINARY IDENTIFICATION OF EVIDENCE PURSUANT TO PATENT LOCAL RULE 4-2

by placing a true copy thereof in a sealed envelope(s) addressed as stated below and causing such envelope(s) to be deposited in the U.S. Mail at East Palo Alto, California.

F.T. Alexandra Mahaney; amahaney@wsgr.com
Natalie J. Morgan; nmorgan@wsgr.com
Wilson Sonsini Goodrich & Rosati
12235 El Camino Real, Suite 200
San Diego, California 92130

Bruce R. Genderson; bgenderson@wc.com
Aaron P. Maurer; amaurer@wc.com
Rachael Shanahan Rodman; rrodman@wc.com
Adam D. Harber; aharber@wc.com
Williams & Connolly LLP
725 – 12th Street, N.W.
Washington, D.C. 20005

☒ (MAIL) I am readily familiar with this firm's practice of collection and processing correspondence for mailing. Under that practice it would be deposited with the U.S. postal service on that same day in the ordinary course of business. I am aware that on motion of party served, service is presumed invalid if postal cancellation date or postage meter date is more than 1 day after date of deposit for mailing in affidavit.

☒ (EMAIL/ELECTRONIC TRANSMISSION) Based on a court order or an agreement of the parties to accept service by e-mail or electronic transmission, I caused the documents to be sent to the persons at the e-mail addresses listed above. I did not receive, within a reasonable time after the submission, any electronic message or other indication that the transmission was unsuccessful.

I declare under penalty of perjury that I am employed in the office of a member of the bar of this Court at whose direction the service was made and that the foregoing is true and correct.

Executed on May 12, 2008, at East Palo Alto, California.

Sonya Schwab
(Type or print name)

Sonya Schwab
(Signature)

Exhibit A

EXHIBIT A
U.S. Patent No. 5,913,813

'813 CLAIM TERM AT ISSUE	PRELIMINARY CONSTRUCTION and IDENTIFICATION OF CORRESPONDING STRUCTURE	PRELIMINARY IDENTIFICATION OF INTRINSIC AND EXTRINSIC EVIDENCE
"inner spatial volume" (claims 1, 2, 12)	*a region of space surrounded by an outer spatial volume and either enclosed by a polymeric film wall or defined by the outside surface of a solid radionuclide*	Abstract Col. 1:50 – col. 2:3 Col. 2:33-38, 44-63 Col. 3:9-16, 42-48 Col. 3:64 – col. 4:12 Col. 4:16-20, 21-31, 32-52 Figs. 1, 3-5 Notice of allowability (12-18-98) at 2 September 8, 1998 Amendment at 3-7 4-27-07 Claim Construction Order at 3-5, 28 (Case No. C-05-05312 RMW), and all evidence of record relating to the claim construction proceeding in that case 4-25-08 Order Denying Plaintiffs' Motion For Preliminary Injunction at 6-8

'813 CLAIM TERM AT ISSUE	PRELIMINARY CONSTRUCTION and IDENTIFICATION OF CORRESPONDING STRUCTURE	PRELIMINARY IDENTIFICATION OF INTRINSIC AND EXTRINSIC EVIDENCE
"outer, closed, inflatable, chamber" (claim 1)	*outer, closed, inflatable chamber*	Abstract Col. 1:26 - 46 Col. 2:37-41 Col. 4:21-31, 40-45 Figs. 1, 3-5 Notice of allowability (12-18-98) at 2 September 8, 1998 Amendment at 3-7 4-27-07 Claim Construction Order at 6, 28 (Case No. C-05-05312 RMW)), and all evidence of record relating to the claim construction proceeding in that case
"predetermined constant spacing between said inner spatial volume and the radiation transparent wall" (claim 1)	*spacing predetermined by one skilled in the art between the wall or edge of the inner spatial volume and the radiation transparent wall of the outer, closed, inflatable chamber, when inflated, which is constant in all directions if the outer chamber is spherical, or constant along a radial plane if the outer chamber is not spherical*	Abstract Col. 1:26 – 46 Col 3:10-13 Col 4:13-20 Col. 4:21-31 Notice of allowability (12-18-98) at 2 September 8, 1998 Amendment at 3-7 4-27-07 Claim Construction Order at 6-7, 28 (Case No. C-05-05312 RMW), and all evidence of record relating to the claim construction proceeding in that case

'813 CLAIM TERM AT ISSUE	PRELIMINARY CONSTRUCTION and IDENTIFICATION OF CORRESPONDING STRUCTURE	PRELIMINARY IDENTIFICATION OF INTRINSIC AND EXTRINSIC EVIDENCE
"means…for rendering uniform the radial absorbed dose profile of the emissions from the one of the inner spatial volume and outer chamber containing the radionuclides" (claim 1)	*function: making the absorbed dose of radiation more uniform to prevent over-treatment of body tissue at or close to the outer wall of the instrument* *structure: a radiation absorbing or attenuating material, e.g., air, x-ray contrast fluid, contrast media used in angiography, water, a gas, or barium sulfate or their equivalents*	"Uniform"—"Always the same, as in character or degree, unvarying" (The American Heritage College Dictionary (3rd Ed. 1997), "AHD")) Abstract Col. 1:26-46 Col. 1:50 – col. 2:3 Col. 2:44-63 Col. 3:14-38 Col. 3:49 – col. 4:12 Col. 4:21-31 Col. 4:56-61 Figs. 1, 3-5 Notice of allowability (12-18-98) at 2 September 8, 1998 Amendment at 3-7 4-27-07 Claim Construction Order at 8-10, 28 (Case No. C-05-05312 RMW)), and all evidence of record relating to the claim construction proceeding in that case
"inner, closed chamber" (claim 2)	No construction necessary	
"plurality of radioactive solid particles" (claim 12)	No construction necessary	
"predetermined locations" (claim 12)	No construction necessary	
"plurality of radioactive solid particles placed at pre-determined locations" (claim 12)	No construction necessary	

Exhibit B

EXHIBIT B
U.S. Patent No. 6,413,204

‘ 204 CLAIM TERM AT ISSUE	PRELIMINARY CONSTRUCTION and IDENTIFICATION OF CORRESPONDING STRUCTURE	PRELIMINARY IDENTIFICATION OF INTRINSIC AND EXTRINSIC EVIDENCE
“inner spatial volume” (claims 1, 2, 3)	*a region of space surrounded by an outer spatial volume and either enclosed by a polymeric film wall or defined by the outside surface of a solid radionuclide sphere.*	Abstract Col. 2:7-33 Col. 2:36-68 Col. 3:19-45 Col. 3:57-65 Col. 3:66 – col. 4:5 Col. 4:4-14, 44-67 Col. 5:1-12 Col. 5:13-41 Col. 8:7-12 FIGS. 1, 3-7 June 20, 2000 Office Action at 3-5 December 20, 2000 Amendment at 8-19 4-27-07 Claim Construction Order at 3-5, 28 (Case No. C-05-05312 RMW)), and all evidence of record relating to the claim construction proceeding in that case 4-25-08 Order Denying Plaintiffs’ Motion For Preliminary Injunction at 6-8

‘ 204 CLAIM TERM AT ISSUE	PRELIMINARY CONSTRUCTION and IDENTIFICATION OF CORRESPONDING STRUCTURE	PRELIMINARY IDENTIFICATION OF INTRINSIC AND EXTRINSIC EVIDENCE
“outer spatial volume” (claims 1, 2, 17)	*a region of space defined by an expandable surface element and surrounding an inner spatial volume*	Abstract Col. 2:7-33 Col. 2:36-68 Col. 3:19-45 Col. 3: 61 – col. 4:8 Col. 2:61-67 Col. 4:4-10 Col. 5:13-65 Col. 8:7-12 FIGS. 1, 3-7 June 20, 2000 Office Action at 3-5 December 20, 2000 Amendment at 8-19 4-27-07 Claim Construction Order at 17 (Case No. C-05-05312 RMW)), and all evidence of record relating to the claim construction proceeding in that case
“three-dimensional isodose profile that is substantially similar in shape to the expandable surface element” (claim 1)	No construction necessary	

‘ 204 CLAIM TERM AT ISSUE	PRELIMINARY CONSTRUCTION and IDENTIFICATION OF CORRESPONDING STRUCTURE	PRELIMINARY IDENTIFICATION OF INTRINSIC AND EXTRINSIC EVIDENCE
“providing a controlled dose at the outer spatial volume expandable surface to reduce or prevent necrosis in healthy tissue proximate to the expandable surface” (claim 2)	*controlling the ratio of the dose at the expandable surface of the outer spatial volume to the prescribed dose at the depth of interest in the target tissue so that the dose at the expandable surface is not so high that it lethally damages cells in healthy tissue in contact with the expandable surface*	“Control” –“to hold in restraint, to check” (The American Heritage College Dictionary (3rd Ed. 1997), “AHD”)) Abstract Col. 1:14 – col. 2:33 Col. 2: 36-68 Col. 2:46-51 Col. 2: 63-67 Col. 3: 1-16 Col. 3:24-26 Col. 3: 30-45 Col. 5:13 – col. 7:5 Col. 7:6-28 Col. 8:7-12 FIGS. 1, 3-7 December 20, 2000 Amendment at 8-19 4-27-07 Claim Construction Order at 23, 29 (Case No. C-05-05312 RMW)), and all evidence of record relating to the claim construction proceeding in that case

‘ 204 CLAIM TERM AT ISSUE	PRELIMINARY CONSTRUCTION and IDENTIFICATION OF CORRESPONDING STRUCTURE	PRELIMINARY IDENTIFICATION OF INTRINSIC AND EXTRINSIC EVIDENCE
“predetermined spacing…between said inner spatial volume and the expandable surface element” (claim 3)	*the distance between the inner spatial volume and the expandable surface element is determined in advance*	Abstract Col. 1:14 – col. 2:33 Col. 2:36-68 Col. 2:46-51 Col. 2:63-67 Col. 3:1-16 Col. 3:24-26 Col. 3:30-45 Col. 3:57 – col. 4:3 Col. 4:44-67 Col. 5:1-12 Col. 5:13 – col. 6:28 Col. 6:61 – col. 7:5 Col. 7:23-32 Col. 7:58-64 col. 8:7-12 Figs. 1, 3-7 December 20, 2000 Amendment at 8-19 4-27-07 Claim Construction Order at 24-25, 29 (Case No. C-05-05312 RMW)), and all evidence of record relating to the claim construction proceeding in that case
“plurality of solid radiation sources” (claim 17)	No construction necessary	

‘ 204 CLAIM TERM AT ISSUE	PRELIMINARY CONSTRUCTION and IDENTIFICATION OF CORRESPONDING STRUCTURE	PRELIMINARY IDENTIFICATION OF INTRINSIC AND EXTRINSIC EVIDENCE
“isodose profile having a shape substantially similar to the shape of the outer spatial volume” (claim 17)	No construction necessary	

Exhibit C

EXHIBIT C
U.S. Patent No. 6,482,142

'142 CLAIM TERM AT ISSUE[1]	PRELIMINARY CONSTRUCTION and IDENTIFICATION OF CORRESPONDING STRUCTURE	PRELIMINARY IDENTIFICATION OF INTRINSIC AND EXTRINSIC EVIDENCE
[*three-dimensional*] apparatus volume **[*configured to fill an interstitial void*]** (claims 1, 6)	*A three-dimensional geometric solid composed of an expandable outer surface*	Abstract Col. 2:20-53 Col. 2:60-64 Col. 3:20-36 Col. 3:55-62, 66-67 Col. 4: 1-2 Col. 4:27-42 Col. 5:36-65 Col. 6:11-29 Col. 8:1-32 Col. 8:52-59 FIGS 1, 3, 4 February 27, 2002 Amendment at 6-10 4-25-08 Order Denying Plaintiffs' Motion For Preliminary Injunction at 13-16

[1] Hologic believes that construction of the term(s) identified by SenoRx require(s) construction of the entire phrase in which the term appears. Thus, the preliminary construction proposed by Hologic construes the phrase identified by SenoRx in the context of the additional terms highlighted within brackets.

'142 CLAIM TERM AT ISSUE[1]	PRELIMINARY CONSTRUCTION and IDENTIFICATION OF CORRESPONDING STRUCTURE	PRELIMINARY IDENTIFICATION OF INTRINSIC AND EXTRINSIC EVIDENCE
located so as to be spaced apart from the apparatus volume (claim 1)	*located so as to be not on or touching the apparatus volume*	Abstract Col. 2:20-53 Col. 3:20-25, 55-62, 66-67 Col. 4: 1-2 Col. 4: 27-30, 35-57 Col. 5:36-65 Col. 6:11-29 Col. 7:1-15 Col. 7: 49-55 Col. 8:1-32 Col. 8:52-59 FIGS 1, 3, 4 February 27, 2002 Amendment at 6-10 4-25-08 Order Denying Plaintiffs' Motion For Preliminary Injunction at 13-16

'142 CLAIM TERM AT ISSUE[1]	PRELIMINARY CONSTRUCTION and IDENTIFICATION OF CORRESPONDING STRUCTURE	PRELIMINARY IDENTIFICATION OF INTRINSIC AND EXTRINSIC EVIDENCE
asymmetrically located and arranged within the expandable surface (claim 1)	*Located and arranged so as not to be on the longitudinal axis of the expandable surface*	Abstract Col. 2:20-53 Col. 3:7-19 Col. 3:55-62, 66-67 Col. 4: 1-2 Col. 5:12-37 Col. 6:11-29 Col. 6:24-67 col. 7:1-15 Col. 8:1-32 Col. 8:52-59 FIGS 1, 3, 4 February 27, 2002 Amendment at 6-10

'142 CLAIM TERM AT ISSUE[1]	PRELIMINARY CONSTRUCTION and IDENTIFICATION OF CORRESPONDING STRUCTURE	PRELIMINARY IDENTIFICATION OF INTRINSIC AND EXTRINSIC EVIDENCE
predetermined asymmetric isodose curves (claims 1, 6, 8)	*Predetermined isodose curves that are not symmetric with respect to the longitudinal axis of the apparatus volume*	Abstract Col. 2:20-53 Col. 2:60 – col. 3:1 Col. 3:7-19 Col. 5:12-37 Col. 6:11-29 Col. 6:24-67 Col. 7:28-48 Col. 7:62 – col. 8:3 Col. 8:1-32 Col. 8:52-59 February 27, 2002 Amendment at 6-10
plurality of solid radiation sources (claim 6)	No construction necessary	
being provided on at least two elongate members extending into the apparatus volume (claim 6)	No construction necessary	

'142 CLAIM TERM AT ISSUE[1]	PRELIMINARY CONSTRUCTION and IDENTIFICATION OF CORRESPONDING STRUCTURE	PRELIMINARY IDENTIFICATION OF INTRINSIC AND EXTRINSIC EVIDENCE
[At least one of the elongate members] being shaped to provide asymmetric placement of the radiation source with respect to a longitudinal axis ***[through the apparatus volume]*** (claim 6)	*At least one elongate member is shaped so as to place the radiation source not on the longitudinal axis through the apparatus volume*	Abstract Col. 2:20-53 Col. 3:7-19 Col. 3:55-62, 66-67 Col. 4: 1-2 Col. 5:11-35 Col. 6:11-29 Col. 6: 30-67 Col. 8:1-32 Col. 8:52-59 FIGS 1, 3, 4 February 27, 2002 Amendment at 6-10

F.T. Alexandra Mahaney, State Bar No. 125984
WILSON SONSINI GOODRICH & ROSATI
Professional Corporation
12235 El Camino Real, Suite 200
San Diego, CA 92130
Telephone: (858) 350-2300
Facsimile: (858) 350-2399
Email: amahaney@wsgr.com

Bruce R. Genderson (admitted *pro hac vice*)
Aaron P. Maurer (admitted *pro hac vice*)
Rachel Shanahan Rodman (admitted *pro hac vice*)
Adam D. Harber (admitted *pro hac vice*)
WILLIAMS & CONNOLLY LLP
725 Twelfth St. NW
Washington, DC 20005
Telephone: (202) 434-5000
Facsimile: (202) 434-5029

Attorneys for Defendant and Counterclaimant
SENORX, INC.

IN THE UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN JOSE DIVISION

HOLOGIC, INC., CYTYC CORPORATION and HOLOGIC L.P.,

Plaintiffs,

v.

SENORX, INC.,

Defendant.

SENORX, INC.,

Counterclaimant,

v.

HOLOGIC, INC., CYTYC CORPORATION and HOLOGIC L.P.,

Counterdefendants.

Case No. 08-CV-0133 RMW

DECLARATION OF WILLIAM F. GEARHART IN SUPPORT OF DEFENDANT SENORX, INC.'S MOTION FOR PARTIAL SUMMARY JUDGMENT OF NON-INFRINGEMENT

Date: June 25, 2008
Time: 2:00 p.m.
Courtroom: 6, 4th Floor
Judge: Hon. Ronald M. Whyte

I, William F. Gearhart, declare that:

BACKGROUND

1. The facts set forth below in this declaration are based on my personal knowledge, and if called as a witness, I could and would testify competently to those facts.

2. Since December 1999, I have been employed by SenoRx, Inc. as the Vice President for Sales and Marketing. In that role, I am responsible for the marketing and sales of SenoRx's entire product line. I supervise approximately 65 employees, which includes a sales force working throughout the country to promote SenoRx's products.

3. Prior to my position at SenoRx, I held management positions at a number of medical device companies, including Vice President, Sales and Marketing at Micro Therapeutics, a manufacturer of devices for the treatment of neuro and peripheral vascular diseases; Vice President of Sales and Marketing at Interventional Technologies, a manufacturer of devices for use in interventional cardiology; and Vice President of Sales and Marketing at Pfizer, a pharmaceutical company.

4. I received my undergraduate degree from the University of Pennsylvania, where I earned a B.S. in Business. I also received a M.B.A. from the University of Michigan and a J.D. from William Mitchell College of law.

THE CONTURA

5. The Contura™ Multi-Lumen Balloon ("Contura") is SenoRx's flagship therapeutic device. It is the company's first and only product for the treatment of breast cancer.

6. The Contura is pictured in Exhibit 1 hereto. The Contura is a balloon catheter device. Referring to Exhibit 1, the balloon is labeled "A." The balloon, which is spherical when inflated, is attached to the end of a catheter body, labeled "B." There are a number of lumens that run through the catheter body from one end of the Contura (the proximal end, "C") through to the other end (the distal end, "D"). Five of these lumens are designed to have a radiation source inserted into them; one is positioned in the center of the catheter body, and the other four are offset from the center lumen, and spaced at 90 degree increments (so that one is located above, one below, and one to either side of the central lumen). Another lumen connects to a

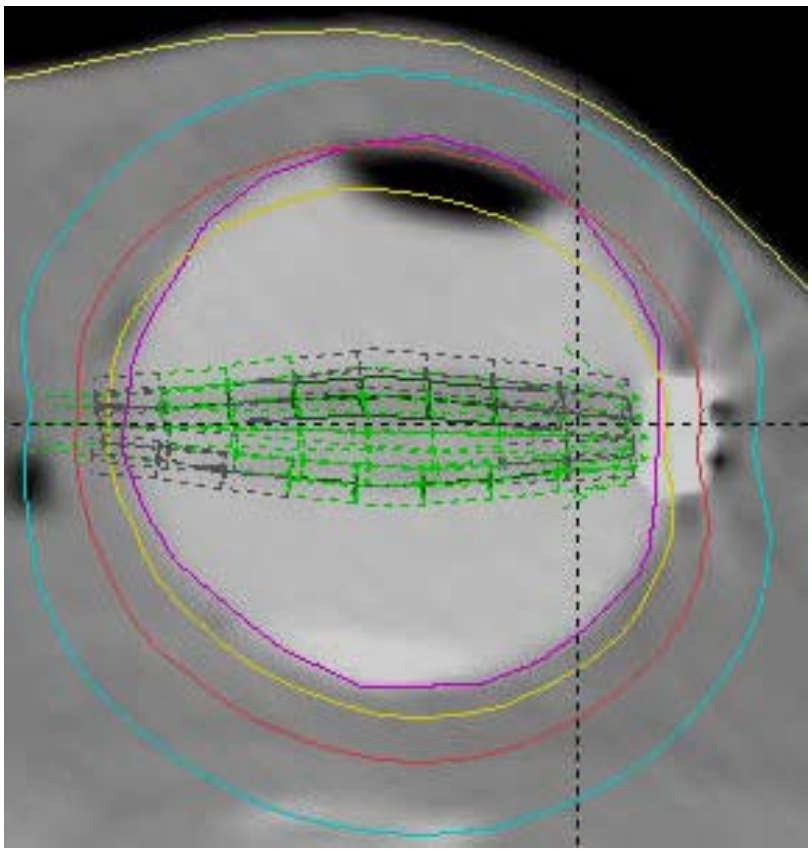
vacuum port at the far end of the device, assisting physicians in conforming the walls of the lumpectomy cavity to the balloon by removing air and liquids from the cavity. A final lumen connects to the polyurethane balloon, and allows the balloon to be inflated and deflated.

7. To date, doctors have implanted over 500 Conturas in patients. Part of my responsibilities is to communicate with radiation physicists and radiation oncologists about their use of the Contura device. The SenoRx sales force reports to me, and I also receive information from our sales team concerning how the Contura is used in the market. Based on discussions with radiation oncologists, radiation physicists and our sales team, I am familiar with how the Contura generally is used to treat patients.

8. In the vast majority of cases, the dosing profile for the Contura involves the use of multiple lumens, and I understand that there have been only a small number of instances in which only the central lumen was used. Also, in the vast majority of cases, multiple dwell positions are used in those lumens. After the initial testing of the device in 2007, I am not aware of a single instance in which only the central dwell position of the central lumen has been used.

9. In addition, in the vast majority of cases, the shape of the isodose profile designed by the radiation physicist differs from the shape of the inflated balloon, which is spherical. This is because most physicians desire a radiation dose profile that minimizes radiation exposure to the skin, ribs or other sensitive areas.

10. Depicted below is an exemplary treatment plan using the Contura that is part of SenoRx's marketing materials. It depicts the use of multiple dwell positions in multiple lumens. Each rectangular box represents a possible dwell position; the green boxes depict the positions where the radionuclide would dwell during this exemplary treatment plan, and the gray boxes are positions that are not used.



I declare under penalty of perjury that the foregoing is true and correct.

Dated: May 20, 2008

William F. Gearhart

Exhibit 1

Picture of the Contura MLB™ (with labels)

CERTIFICATE OF SERVICE
U.S. District Court, Northern District of California,
Hologic, Inc. et al. v. SenoRx, Inc.
Case No. C-08-0133 RMW (RS)

I, Kirsten Blue, declare:

I am and was at the time of the service mentioned in this declaration, employed in the County of San Diego, California. I am over the age of 18 years and not a party to the within action. My business address is 12235 El Camino Real, Ste. 200, San Diego, CA, 92130.

On May 21, 2008, I served a copy(ies) of the following document(s):

DECLARATION OF WILLIAM F. GEARHART IN SUPPORT OF DEFENDANT SENORX, INC.'S MOTION FOR PARTIAL SUMMARY JUDGMENT OF NON-INFRINGEMENT

on the parties to this action by the following means:

Henry C. Su (suh@howrey.com) Katharine L. Altemus (altemusk@howrey.com) HOWREY LLP 1950 University Avenue, 4th Floor East Palo Alto, CA 94303 Telephone: (650) 798-3500 Facsimile: (650) 798-3600	Attorneys for Plaintiffs HOLOGIC, INC. CYTYC CORPORATION and HOLOGIC LP
Matthew Wolf (wolfm@howrey.com) Marc Cohn (cohnm@howrey.com) HOWREY LLP 1229 Pennsylvania Avenue, NW Washington, DC 20004 Telephone: (202) 783-0800 Facsimile: (202) 383-6610	Attorneys for Plaintiffs HOLOGIC, INC. CYTYC CORPORATION and HOLOGIC LP

☒ (BY MAIL) I placed the sealed envelope(s) for collection and mailing by following the ordinary business practices of Wilson Sonsini Goodrich & Rosati, 12235 El Camino Real, Ste. 200, San Diego, CA. I am readily familiar with WSGR's practice for collecting and processing of correspondence for mailing with the United States Postal Service, said practice being that, in the ordinary course of business, correspondence with postage fully prepaid is deposited with the United States Postal Service the same day as it is placed for collection.

☒ (BY ELECTRONIC MAIL) I caused such document(s) to be sent via electronic mail (email) to the above listed names and email addresses.

☒ (BY CM/ECF) I caused such document(s) to be sent via electronic mail through the Case Management/Electronic Case File system with the U.S. District Court for the Northern District of California.

I declare under penalty of perjury under the laws of the United States that the above is true and correct, and that this declaration was executed on May 21, 2008.

Kirsten Blue

F.T. Alexandra Mahaney, State Bar No. 125984
WILSON SONSINI GOODRICH & ROSATI
Professional Corporation
12235 El Camino Real, Suite 200
San Diego, CA 92130
Telephone: (858) 350-2300
Facsimile: (858) 350-2399
Email: amahaney@wsgr.com

Bruce R. Genderson (*admitted pro hac vice*)
Aaron P. Maurer (*admitted pro hac vice*)
Rachel Shanahan Rodman (*admitted pro hac vice*)
Adam D. Harber (*admitted pro hac vice*)
WILLIAMS & CONNOLLY LLP
725 Twelfth St. NW
Washington, DC 20005
Telephone: (202) 434-5000
Facsimile: (202) 434-5029

Attorneys for Defendant and Counterclaimant
SENORX, INC.

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

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HOLOGIC, INC., CYTYC CORP., and HOLOGIC L.P.,

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CASE NO.: 08-CV-0133 RMW

[PROPOSED] ORDER GRANTING DEFENDANT SENORX, INC.'S MOTION FOR PARTIAL SUMMARY JUDGMENT OF NON-INFRINGEMENT ('813 PATENT, CLAIMS 11 & 12; '204 PATENT, CLAIMS 4 & 17; AND '142 PATENT CLAIM 6)

The Court having considered Defendant SenoRx, Inc.'s Motion for Partial Summary Judgment of Non-Infringement, the Memorandum in Support thereof, and the attached exhibits, and any Opposition thereto, any reply, and for good cause shown;

IT IS HEREBY ORDERED that SenoRx's Motion for Partial Summary Judgment of Non-Infringement is GRANTED; and

FURTHER ORDERED that Claims 11 and 12 of U.S. Patent No. 5,913,813, claims 4 and 17 of U.S. Patent No. 6,413,204, and claim 6 of U.S. Patent No. 6,482,142 are not infringed.

SO ORDERED.

Dated: _____, 2008

By: _____
Hon. Ronald M. Whyte
United States District Judge

CERTIFICATE OF SERVICE
U.S. District Court, Northern District of California,
Hologic, Inc. et al. v. SenoRx, Inc.
Case No. C-08-0133 RMW (RS)

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Kirsten Blue